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No. XV. OF VOL. I., 1942. LONDON, SATURDAY, APRIL 11, 1942 Pp. 56—Price 1s.
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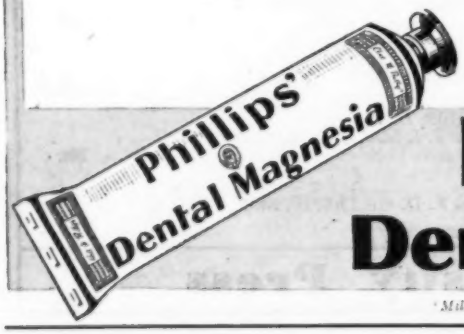

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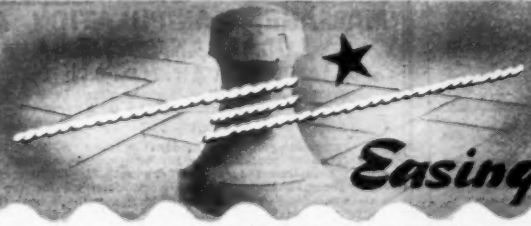

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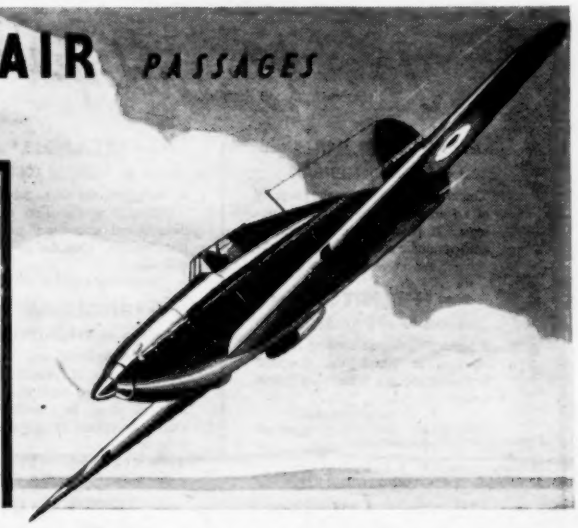

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POST-SHOCK METABOLIC RESPONSE *

D. P. CUTHBERTSON, M.D., D.SC. GLASG.
GREIVE LECTURER IN PHYSIOLOGICAL CHEMISTRY IN THE UNIVERSITY OF GLASGOW

THE physiological response to trauma, in particular its metabolic component, exhibits a very complex picture. After an injury there is an immediate and well-marked disturbance of cellular vitality in the injured zone due to the actual damage done. The capillaries dilate and their permeability increases, leading to what has been termed "reactionary œdema" and to depression of the local metabolism. The effects of the lesion spread and there is a discharge of leucocytes from the bone-marrow. How far some of these manifestations are due to the liberation of nucleic acid or its derivatives or to some metabolite, and how far to a vasomotor reaction, is not certain. Menken (1939, 1940) has obtained a crystalline nitrogenous material which apparently increases capillary permeability and the migration of leucocytes. Provided the damage done is not immediately fatal, there is as a rule evidence of what appears to be a compensatory reaction involving the vasoconstrictive-adrenaline mechanism (McDowall 1940). The local developments, on the other hand, may be such as to cause the general situation to deteriorate and lead to the development of manifest shock; the compensatory mechanism which in greater or less degree has come into effect then exhibits a definite depression. The depressed stage is usually succeeded by a period when there is an increase in the local metabolism (traumatic inflammation), characterised by the increased cellular activity of the repair process, by the lysis and effluxion of the damaged tissue elements, and by what appears to be an increased and apparently generalised katabolism especially of protein.

As long ago as 1794 John Hunter wrote with a rare perception: "There is a circumstance attending accidental injury which does not belong to disease—namely, that the injury done has in all cases a tendency to produce both the disposition and the means of cure."

THE EBB PERIOD

It is not my purpose to discuss the problem of traumatic shock, but there are one or two aspects of the picture to which I would invite your attention. Wound shock has for too long been regarded as a complication rather than as an integral part of the phenomena associated with injury. The necessity for a wide conception of the response to injury was stressed by Malcolm in his classical description of "The Physiology of Death from Traumatic Fever" (1893), and within the last few months Grant and Reeve (1941) have shown that there is much to be learnt from a study of the reaction or reactions to injury, by observers with an open mind.

The various theories which have been put forward to account for this phenomenon of traumatic shock seem to relate only to certain facets of this initial phase of the reaction to injury. It might be described as the period of "ebb" and is characterised by a depressed metabolism. It is generally recognised that other influences come into play during the initiation and perpetuation of this state—namely, anæmia, anoxia, pain and loss of body heat. Fatigue and previous dehydration may, among other factors, also play a part, particularly among Service cases. Hæmorrhage itself may produce an end-result like that following trauma, due to the oligæmia and anoxia produced. There is, however, apparently not the same loss of capillary tone and permeability as that which results from trauma and in most cases there is a dramatic response to transfusion (Price et al. 1941).

That a general depression of vitality occurs has long been recognised (Declasse 1834, Meltzer 1908), and this has been shown by Henderson, Prince and Haggard (1917) in burns to amount to a decrease in oxygen consumption of 45–50% in the cases studied. Davis (1936) and others have found a reduced oxygen consumption in shocked dogs. Similar changes have been produced experimentally by Aub (1920) and by Gesell, Blair and Trotter (1922). Aub found that the degree of fall in the basal metabolism of cats was roughly proportional to the severity of the shock produced, and that recovery after transfusion was usually associated with a prompt return of the metabolic rate to normal. It was found that this change in metabolic rate might precede the well-marked fall in blood-pressure. This is of particular interest in view of Grant and Reeve's recent observations on the blood-pressure of air-raid casualties.

It is interesting to note too that Carrel (1930), when discussing the causal relations between the loss of a fragment and its regeneration, wrote: "In superficial epithelial wounds, the initiation of healing seems to be due . . . to substances set free by the traumatised cells themselves." Harkins, to whom we are indebted (1941) for an excellent review on the subject of traumatic shock, showed in 1935 that the changes leading to true shock begin as soon as the accident or other precipitating factor takes place.

The immediate result is a dilatation of the capillaries in the area affected and an increase in their permeability. Later capillary systems elsewhere may be affected. The vasoconstriction which results, especially in the young, is as has already been mentioned, in effect a compensatory effort to offset the decreased blood-volume and so protect the vital centres against the harmful effects of a dangerously low blood-pressure (Freeman, Shaffer, Schecter and Holling 1938). The asphyxia of the tissues may well be a factor in inducing this increased permeability (Landis 1928), or may be a result of the increased permeability. Indeed it is extremely difficult to determine what is cause and what effect. There is certainly a reduced venous return to the heart and so the vicious cycle is completed (McDowall 1940).

These changes are accompanied by certain profound alterations in the biochemistry of the blood which varies according to the stage of depressed vitality or compensatory reaction reached. There is undoubted evidence of a profound cellular disturbance. In the later stages it may be characterised particularly by a great increase in the potassium content of the blood and tissue fluids (Scudder 1940). An increase in creatine has also been noted (Aub and Hu 1920). Other changes have been observed as shock develops, such as hyperglycæmia and some degree of nitrogen retention in the blood.

Local physicochemical considerations reveal that the tissues of a cleft-like and gaping wound contain more than their normal amount of fluid (Tammann, Blümel and Roese 1933). This increase occurs rapidly, reaching its maximum at the end of the first day. A gradual decline then follows until normal conditions are reached again in the third week. This increase in water content brings a corresponding influx of electrolytes, and from a study of their concentration it is found that potassium and calcium are increased and sodium and chloride decreased in comparison with the blood-serum.

As a result of the stasis in the vessels there is an accumulation of CO_2 and incomplete products of oxidation, an apparent lessening of hæmorrhagê (Quastel and Racker 1941) and pain (Piéchaud 1880), and in general a stagnation of the products of cellular damage by the increased permeability and dilatation of the capillaries. There is also a fall in body temperature and this while dangerous, does exert certain restrictive influences on the effect of asphyxia. While a certain measure of protection is afforded by this stasis, and for that reason it is perhaps unwise to try to undo it too rapidly before its effects have come into action, it is necessary to note that unless this initial phase of the response to injury is followed by a period of enhanced cellular activity the patient will die.

In shock the body temperature is in general lowered despite the diminished peripheral circulation. The reduced total metabolism and volume of circulating blood are the dominant features. Of all changes produced, the tissue asphyxia is probably the most dangerous to life. It is interesting to recall here that John Hunter is reported to have advocated the use of oxygen. It may be that the hyperglycæmia which is associated with asphyxia and hæmorrhage is an attempt to maintain the nourishment of the cells in the face of a failing blood-supply. In-vitro experiments have demonstrated that the increase in permeability of erythrocytes which occurs during the storage of blood, and which leads

* Arris and Gale lecture, given at the Royal College of Surgeons of England on Feb. 18, 1942.

to an increase in the plasma potassium, is restrained by the addition of glucose to the blood (Harris 1941).

THE FLOW PERIOD

After the period of lowered metabolic activity or "ebb," which we have termed shock and which is initiated by the actual trauma to the cells, direct or indirect, the metabolic activity rises with the onset of what may be termed traumatic inflammation. This process precedes actual repair and is characterised by hyperæmia, exudation, leucocytic emigration and so on; it may be considered to constitute the "flow." As has already been noted, the diminished and altered metabolism attendant on this tissue injury is held to play a part in stimulating the repair process, and Carrel and Baker (1926) have found that the higher cleavage products of certain proteins act in stimulating cell proliferation. Autolysis and heterolysis through tissue and leucocytic enzymes respectively remove the tissue debris, and sloughs which are not absorbed may separate.

My own interest in this aspect of healing developed from a study of the metabolism of calcium and phosphorus in fracture cases, due to my discovery that there was a large discrepancy between the metabolism of these two elements. Whereas the intake and output of calcium showed only minor differences there was a definite loss of phosphorus from the body. This immediately raised the question of the behaviour of nitrogen and sulphur, for the soft tissues seemed to be intimately concerned (Cuthbertson 1930). Evidence of a well-marked loss of nitrogen, sulphur and phosphorus came to light, and it was resolved to determine to what extent disuse atrophy following splinting might play a part in promoting this loss. Metabolic studies (Cuthbertson 1929) in normal subjects revealed an undoubted but small increase in the output of nitrogen, sulphur and phosphorus and to lesser degree of calcium, the rise in the excretion of nitrogen and sulphur being due to increases in the urea and inorganic sulphate output. There was also evidence of a reduction in the volume of the muscles of the legs and a definite but small general reduction in oxygen intake during the period of splintage. Since these changes were slight compared to those noted in the fracture cases a study of the latter in fuller detail, and with as little delay as possible after their admission to hospital, was resumed.

It was found that after injury there might be either a relative or absolute anuria, occasionally lasting for 24 hours, while in other cases there was little apparent disturbance of urine formation. After the period of depressed metabolism the output slowly and often irregularly rose. The maximum volume was usually not attained until about two days after the maximum excretion of nitrogen had appeared. The earliest specimens of urine available indicated the presence of relatively normal amounts of nitrogen, sulphur and phosphorus but these values soon rose, rapidly reaching in the case of nitrogen a value sometimes two or three times the intake. The maximum daily loss might rise as high as 23 g. of nitrogen, this maximum excretion being reached as a rule between the 4th and 8th days following bony or non-bony injury. In the group of postoperative cases (osteotomies, &c.) this peak value was reached rather earlier, usually on the 2nd to 4th day. The maximum output of sulphur coincided in time or occurred on the day following that of nitrogen. A study of the sulphur to nitrogen ratio of the total excess outputs indicated that the substance being katabolised was apparently in the main muscle, and this conclusion was in general supported by the phosphorus to nitrogen ratio. The maximum daily loss was fairly proportional to the total loss whether estimated over 5 or over 10 days. The total loss during 10 days might even reach as high a value as 137 g. of nitrogen in the case of a fracture of both bones of the leg—with a resulting reduction in the nitrogen content of the body amounting to 7·7%.

An attempt was made at this stage to determine if the extent of the nitrogen loss could be correlated with the degree of tissue damage. The evidence indicated that there were certainly grounds for considering that they were related, but it was found that an injury such as the dislocation of an ankle might produce as great a disturbance of metabolism as the splintering of both bones of a leg (Cuthbertson 1932). It may be of course that an error was made in our conception of the extent of the damage done. I well remember a conversation with Mr. Wilfred Trotter in which he lamented the fact that we had no real criterion of the degree of trauma in cases of injury. He urged me to try and determine if some biochemical principle might serve as a clue.

This metabolic upset which I have described was quite independent of the anæsthetics used in the manipulation of some of the cases of injury. Indeed, osteotomy cases showed less metabolic disturbance than did accident cases, probably because they were adequately splinted from the start, suffered less pain, and the injury to soft tissues was almost certainly less.

A search for accounts of experiences similar to ours revealed a few related records. In 1904 Hawk and Gies confirmed the observations of Bauer (1872) and Jürgensen (1885) that hæmorrhage caused an increased elimination of nitrogen, and demonstrated that even the operation of venesection without "blood letting" is sufficient to cause an appreciable though slight increase in the output of nitrogen and sulphur in the dog. During the later years of the last war, Wertheimer, Fabre and Clogne (1919) noted that after the period of shock the amount of ammonia and urea excreted remained at a high level for some time and might even amount to 37 g. urea per day. Waugh (1941) has shown that there is an excessive excretion of urea in cases of bone and joint suppuration.

In most but not all of my cases of injury I found that there was a rise in body temperature resulting from the injury. The general trend of the curve was parallel to that of the urinary excretion of nitrogen but preceded it. With few exceptions the rise never exceeded 3·5° F. The pulse-rate tended sometimes to lag behind the rise in temperature, but in other experiments there was an almost perfect correlation. In certain cases with pronounced quantitative alterations in the urinary products little or no change in either pulse-rate or temperature was detected.

These observations agree with those of Malcolm (1893), who noted that there might be evidence of increased nitrogen metabolism after a major operation although the temperature remained low. The basal consumption of oxygen in my experiments usually rose parallel to the increased excretion of nitrogen. The fluctuations either coincided in time or preceded those of nitrogen by 24–48 hours when they tended to coincide with the rise in body temperature. The average increase was in the neighbourhood of 20–25%, which is in keeping with van't Hoff's law when correlated with the temperature rise.

After the attainment of these maximum values, all these metabolic disturbances declined, particularly the body temperature and pulse-rate. The oxygen consumption in our experiments was not followed for a sufficiently long period to decide what its ultimate level might be. There was certainly evidence that even after six weeks there might still be a small but definite loss of nitrogen.

A study of the protein fractions of the blood-plasma by precipitation methods revealed a well-marked rise in the globulin moiety, which appeared to be increased by further trauma, and a slight lowering of the albumin fraction. The fibrinogen fraction was often appreciably raised. When the ultracentrifuge is applied to the investigation of these changes a truer measure of their significance may be forthcoming. On the whole there was not much retention of non-protein nitrogen (Cuthbertson and Tompsett 1935). Oswald (1910) many years ago showed that the permeability of membranes to albumin is greater than to globulin and their permeability to globulin is greater than to fibrinogen. We have already noted that with an inflammatory reaction there occurs swelling of the capillary wall with increase in permeability. These changes in the level of the plasma proteins after trauma may therefore be related to differences in permeability.

SEARCH FOR THE EXPLANATION

These metabolic experiments, while providing evidence of a well-marked tissue katabolism failed to provide any explanation or to indicate how widespread was the reaction. From its extent and from the S : N ratio of the material involved, muscle was regarded as probably the main source of these katabolites. The question naturally arose as to what disturbance of muscular metabolism would lead to such an enormous and early loss of substance.

Part of this reaction is probably due to the enhanced metabolism which follows the initial phase of depressed

activity. The swing of the pendulum however seems in excess of even such a restoration of function. Wasting through disuse, as we have seen, offers but a partial explanation for the loss. Some reflex trophic effect may possibly be in operation, such as is found in the muscular wasting associated with bone or joint disease. Harding (1925, 1926 and 1929), extending the observations of others, has shown that such an atrophy, which is mainly reflex in character, depends on the integrity of the afferent paths and is accompanied by an increased consumption of oxygen. Such a theory demands an exhaustion of the muscle by an excessive number of abnormal stimuli. This reflex wasting of muscle is undoubtedly responsible, in part, for the increased tissue katabolism which we have observed during the convalescence of certain patients who had their knee-joints incised. It is questionable, however, if this type of "sympathetic" wasting is the main cause of the greatly increased protein katabolism after injury.

Reflex wasting would presumably apply solely to the limb affected and not to the body generally. If, then, the evidence suggested that the excess excretion of katabolites could not be accounted for by the local changes a more general explanation had to be sought. A few of the experiments performed to this date had indicated the necessity for some explanation based on both local and general changes. A study of the nitrogen metabolism of several cases of pneumonia, before and after the crisis, had failed to reveal katabolic effects in excess of those noted in these severe injuries of bone and joint, so that fever did not in itself seem to be the potent factor. At this stage it was necessary to seek information from experiments on lower animals, since the answer could not be derived satisfactorily from human cases. Recourse was made to experiments on the rat (Cuthbertson, McGirr and Robertson 1939).

The metabolism of nitrogen, phosphorus, potassium, sodium, creatine and creatinine were studied, as well as the change in weight of the muscle groups affected, after fracture of the femur by open operation and without splinting. It was found that the osteotomy was followed by a well-marked disturbance of general as well as local metabolism, and this was again evidenced by a well-marked loss of nitrogen, phosphorus and potassium and with some increased creatinuria. Sodium and creatinine remained relatively unaltered; occasionally a slight fall was noted. These products as a rule reached their maximum elimination about the 3rd or 4th day in the rat, slightly earlier than they did in man, although the findings in man had exhibited considerable variation. There was often a small rise in the excretion of these variable katabolites several days later. Following the peak of the metabolic disturbance the various processes declined in intensity, paralleling the changes seen in man.

The excessive loss of potassium was probably the result of cell injury and changes in cell permeability. There was evidence to show that the muscles adjacent to the fracture lost relatively more potassium than nitrogen. The loss of potassium was indeed apparently far greater than could be accounted for by local changes. Excessive creatinuria is probably related to processes taking place in the muscles of the injured limb.

This differential behaviour leads us to inquire how far it is justifiable to assume that the loss in weight is actually due to a complete disintegration of a small fraction of the muscle cells, accompanied by a partial but parallel loss of a portion of the constituents of a large number of cells. Potassium is spent more freely than nitrogen, creatine compared with these losses is preferentially retained, and the existent creatinuria may in greater part be accounted for by the local tissue loss. Nitrogen and potassium cannot therefore arise from a parallel loss of lesser or greater portions of the body's cells. It is interesting to remember that Andreesen and Tammann (1933) found that there was a rise in the potassium and calcium content of the tissue fluids of aseptic wounds. Sodium and chlorine were diminished. During the hyperæmia, which is one of the cardinal signs of the reaction to injury and which constitutes a phase of the healing process, there is this early increase in the permeability of the cells of the inflamed tissue (Schmidtmann and Malthes 1927). This presumably causes a loss of potassium from the cytoplasm. Potassium injected into a wound does appear to promote hyperæmia (Schück 1926, Häbler and Hummel 1928) and causes pain lasting up to an hour after the injection.

From weighing the limbs and muscle groups involved it was obvious that the wastage of body substance could not be fully accounted for by the loss of muscle substance from the site of injury or indeed from the injured limb. There appears to be, in addition to reflex wasting and autolysis, a generalised increase in katabolism to meet the exigencies of the enhanced metabolism of the recuperative process. If it is taken for granted that the excess nitrogen comes from muscle, then the loss of muscle substance can account for four-fifths of the total loss of body-weight. The presumption is that in addition the reserves of carbohydrates and fat are also called on to meet the demand for readily oxidisable material.

EFFECT OF DIET AND PITUITARY EXTRACT

A few experiments were made to determine how far this loss of tissue substance, as indicated by increased excretion of certain katabolites, could be spared by the ingestion of additional food, in particular carbohydrate. It was hardly to be expected that the natural reparative processes could be materially influenced by dietary means but this could not be assumed with certainty until proof was forthcoming. Morgan's early experiments (1906) on salamanders demonstrated that the influence of diet on the regeneration of tissues can only be of secondary importance, for salamanders receiving no food regenerate their amputated limbs just as rapidly as do well-fed animals. Howes and others (1933) found, too, that the rate of healing of stomach wounds of adult rats was not noticeably affected by complete starvation or by a half-adequate diet. The healing rate in young rats was, however, affected.

Difficulties were encountered in applying this type of experiments, for the animals were readily put off their basic diet, which had to be kept slightly below the optimal level in order to allow the animal to continue on a constant intake throughout the whole preoperative and postoperative period. It was found impossible to make the animals eat more food during the first few days after the operation. Later, evidence was obtained that additional carbohydrate exercised a definite sparing effect on the general loss of tissue substance, although it did not appreciably affect the local tissue wastage. Further experiments were necessary and obviously they were this time applicable to the human being.

Patients with fractures of the femur or of the bones of the legs due to direct violence were selected (Cuthbertson 1936) and within a day or two after trauma they were given diets rich in protein, calories or both. It was found that these diets considerably modified the urinary losses. Diets rich in first-class protein and containing the maximum number of calories which the patient could consume (as much as 230 g. protein were consumed daily by one patient and 4100 calories by another) failed to eliminate a negative nitrogen balance at the height of the katabolic process. There occurred first a period of retention of nitrogen while the nitrogen excretion was rising, then a period of loss, to be followed later by another period of retention. The failure to attain nitrogen equilibrium at the height of katabolism in our cases is the more extraordinary since there was relatively little, if any, disturbance of body temperature, and since we found that when excess food is given to a normal uninjured person a well-marked retention of nitrogen and sulphur takes place, temporarily at least (Cuthbertson, McCutcheon and Munro 1937, Cuthbertson and Munro 1937). In some of our injuries caused by indirect violence, where there was not the same extent of soft tissue damage, nitrogen retention was observed on surplus diets.

In passing it should be noted that in wound healing experiments Clark (1919) found that a high protein diet eliminated the quiescent period which precedes construction and epithelialisation, whereas a high fat diet lengthened this period to six days and carbohydrate and mixed diets gave intermediate values. Thompson, Ravdin and Frank (1938) have shown that the hypoproteinæmic dog is frequently incapable of normal fibroplasia, and more recently Rhoads, Fliegelman and Panzer (1942) have made the interesting observation that this fibroplasia can occur if the dog is given ample amounts of acacia intravenously to maintain the colloid

osmotic pressure of the plasma. Acacia solution is not recommended for hypoproteinæmia in patients.

Conditions which undermine the general nutrition, such as prolonged vitamin deficiency and particularly lack of vitamin C, also retard wound healing. There is a considerable though not unanimous body of experimental evidence in support of this thesis (Saitta 1929, Lanman and Ingalls 1937, Taffel and Harvey 1938, Hunt 1941 and others). Crandon's experiment (Lund and Crandon 1941) on himself suggested that a very prolonged deprivation of vitamin C (six months) is necessary in the healthy subjects before effects on intercellular substance and collagen formation affect wound healing. It is obvious that patients with peptic ulcer on an ill-balanced diet might exhibit such a deficiency in wound healing.

In the course of an investigation into the action of a crude extract of anterior pituitary tissue of the ox we noticed that the extract had definite nitrogen-retaining properties when injected into the rat (Cuthbertson, Webster and Young 1941). Experiments showed that this particular extract, when injected daily into rats suffering from a fractured femur, produced by open operation, prevented the loss in body-weight and excessive loss of nitrogen and creatine which were the usual concomitants of such an injury. The effect of the extract on the metabolism of the injured animal was general rather than local, and possibly represented the normal growth response to this extract, superimposed on and thereby masking the increased katabolism following injury. Observations of the rate at which the atrophied muscles were restored under the influence of the pituitary extract showed that, although the animal as a whole grew more rapidly under the pituitary stimulus and the total protein katabolism was in general covered by a protein anabolism, no greater rate of restitution of the atrophied muscles of the injured limb was thus induced. In other words, the promotion of a general protein anabolism provided no special stimulus for the restoration of the muscles of the injured limb. Further, the extract had no significant effect on the total time required to heal superficial wounds (Cuthbertson, Shaw and Young 1941a and b).

This experiment demonstrated that the rate of wound healing was not significantly accelerated by a substance which induced an acceleration of general growth—that is, local anabolism was not affected by general anabolism. Could it be that a general katabolism might influence local anabolism? Preliminary observations, made with the assistance of Dr. T. H. C. Barclay and Mr. Alick Isaacs, have shown that the feeding of dried thyroid accelerates the rate of wound healing.

Earlier we suggested that the increased katabolism which we have noted may intimately be concerned in the healing process. Carrel (1921) considered that "slight infection" of an experimental wound by staphylococci in bouillon or "irritation by such substances as turpentine and chick embryo extracts shortens the latent period of healing of experimental wounds in the dog (to less than two days) as compared with a "non-irritating antiseptic dressing." Young, Fisher and Young (1941) have deduced from their experiments that some accelerating factor must operate in the closure (or healing) of a secondary wound which is lacking in primary wounds, but the nature of this factor has not been determined, whether it be a "growth-promoting substance" liberated by the primary wounds, a by-product of immunity, or some other principle. They too concluded that healing cannot be exclusively a local phenomenon but must depend to some extent on general or constitutional factors.

* * *

It may be said that injury to an animal leads to lessened activity, and lessened activity reduces its capacity to find food. The necessity for reparation is urgent and the body may require and may prefer to katabolise its reserves to meet the exigencies of the moment. The work of Mme. Roche on the "plasticity" of the protein molecule lends support to the view that considerable alteration in the complexity of the protein molecules may take place without degeneration of the cell (Roche 1933, 1934). Truly "protein contains the magic of life." In its ebb and flow, its katabolism and anabolism we shall find a clue to the reactions to injury which control the disposition and the means of cure.

SUMMARY

The physiological response to trauma, in particular its metabolic component, exhibits a complex picture. The period of shock, characterised essentially by depressed cellular metabolism, is initiated by the actual trauma to the cells, direct or indirect. After this the metabolic rate rises with the onset of traumatic inflammation. The diminished and altered metabolism attendant on the tissue damage plays a part in stimulating the repair process.

Patients with moderate or severe physical injury—e.g., fracture of a long bone—frequently showed a relative or absolute anuria of varying duration during the first 24 hours. The urinary volume then slowly and often irregularly rose. The earliest specimens exhibited normal amounts of nitrogen, sulphur and phosphorus but these values soon rose, and the daily loss of nitrogen might exceed 23 g. As a rule the maximum excretion of nitrogen was reached between the 4th and 8th day after bony or non-bony injury; in a group of postoperative cases (osteotomies, &c.) the peak was reached rather earlier.

The nitrogen: sulphur and nitrogen: phosphorus ratios of the total excess outputs suggested that the substance katabolised was mainly muscle protein.

The metabolic upset could not be explained on the basis of a disuse atrophy, although this undoubtedly accounted for a loss of nitrogen, sulphur and phosphorus in the urine; nor was it due to the use of anæsthetics.

Usually, though not always, the injury produced a rise in body temperature. The general trend of the temperature curve was parallel to that of the urinary nitrogen but preceded it in time. The rise rarely exceeded 3·5° F. The pulse-rate curve sometimes lagged behind the temperature but in other experiments there was almost perfect correlation. The basal oxygen consumption usually rose parallel to the increase in nitrogen excretion.

After attaining maximal values all the metabolic disturbances declined, but even after six weeks there might be a small but definite loss of nitrogen.

A study of the protein fractions of the blood-plasma by precipitation methods revealed a rise in globulin, which appeared to be increased by further trauma, and a slight lowering of the albumin fraction. The fibrinogen fraction was often appreciably raised. On the whole there was not much retention of nitrogen.

After fracture of a femur by open operation and without splinting rats showed a well-marked disturbance of general as well as local metabolism, evidenced by loss in the urine of nitrogen, phosphorus and potassium and increased creatinuria. Sodium and preformed creatinine remained relatively unaltered or occasionally fell slightly.

The wastage of body substance after injury could not be fully accounted for by the loss of muscle substance from the site of injury or indeed from the injured limb. In addition to the reflex wasting and autolysis, there appears to be a general increase in katabolism, of protein in particular, to meet the enhanced metabolism of the repair process.

Diets rich in first-class protein, and containing the maximum of calories which the patient could consume, failed to eliminate negative nitrogen balance at the height of the katabolic process in many cases of fracture due to direct-violence. In some cases of injury due to indirect violence, where there was not so much tissue damage, nitrogen retention was observed on surplus diets.

A crude extract of the anterior pituitary gland of the ox, with well-marked nitrogen-retaining properties, was injected into rats with a fractured femur. Although the animals as a whole grew more rapidly, and the total protein katabolism was in general covered by a protein anabolism, restitution of the muscles was not accelerated. The extract also had no significant effect on the total period required to heal superficial wounds.

In injured animals fed on dried thyroid gland the healing of surface wounds was accelerated, suggesting that an enhanced metabolism might influence local anabolism.

References at foot of opposite page

INTRAPERITONEAL SULPHANILAMIDE
ITS PROPHYLACTIC AND THERAPEUTIC VALUE

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IN April, 1941, we published an account of animal experiments demonstrating the good effects of sulphanilamide implanted in the peritoneal cavity in preventing peritonitis when the peritoneum had been grossly contaminated. The use, both prophylactically and therapeutically, of this form of chemotherapy on clinical cases was advocated, and we described the first six cases treated in this way, the results of which were sufficiently encouraging to convince us that the treatment was of value and should be continued. The results obtained since then seem conclusive enough to warrant the publication of a comparatively small series of cases.

Although since 1938 we had applied sulphanilamide powder locally to wounds and surgical incisions at various sites, it was not until October, 1940, that we began to instil the drug into the peritoneal cavity. We propose to compare the results obtained in cases treated from the start of the war up to October, 1940, which we will call the first series, with those in a second series from October, 1940, to October, 1941. In many cases in our first series sulphanilamide or sulphapyridine was administered by mouth, intravenously or intramuscularly, and it was because the results were so disappointing that we began the animal experiments in the hope of finding a more efficacious form of chemotherapy. Apart from chemotherapy, there is no difference in the technique adopted in the two series, with one exception. In both, gastric or duodenal suction was adopted in cases of intestinal obstruction, whether mechanical or paralytic associated with peritonitis, but there is little doubt that the technique of suction drainage employed in our later cases was more efficient than that used earlier, for although there was no difference in the actual intubation, a Ryle's tube being used throughout, by 1941 we had evolved a standardised method of application which combined the best points of the various techniques we had investigated in 1939 and 1940. Nevertheless, while suction drainage effectively applied is undoubtedly of great value in any case of intestinal obstruction, yet we do not feel that the difference in technique can explain the drop in our fatality-rate. We must conclude that this drop is connected with the adoption of intraperitoneal sulphanilamide as a routine prophylactic or therapeutic agent.

We may consider first those cases of abdominal section in which there was a definite risk of severe peritonitis, though not a great risk—e.g., perforated peptic ulcer, acute appendicitis with local peritonitis, appendix abscess, colostomy, ileostomy, acute pancreatitis, operations on the biliary tract, salpingitis, and acute intestinal obstruction excluding cases of resection of gut. In our first series 85 such cases were dealt with, 9 dying, a fatality of 10·6%. In our second series the figures were 101 cases with 6 deaths, a fatality of just under 6%.

A second group of cases consisted of those in which the patient appeared to be in great danger of death from peritonitis. It included cases of grave general peritonitis present before operation, resection of strangulated gangrenous gut, resection of gut in the presence of intestinal obstruction, and perforations of the gut with gross contamination of the peritoneum, for example perforated diverticulitis. In our first series 18 such cases were treated, 10 dying, a fatality of 55·5%. The corresponding figures for our second series were 24 cases with 2 deaths, a fatality of 8·3%. Of the 2 fatal cases death was due in one to peritonitis in a case admitted 5 days after a perforation of a gastric ulcer, and in the other to general peritonitis caused 10 days after operation by sloughing of one loop of a Paul's colostomy because of an inadequate blood-supply. This comparison of fatality-rates is summarised in the table.

RESULTS IN COMPARABLE CASES BEFORE AND AFTER THE ROUTINE ADOPTION OF INTRAPERITONEAL CHEMOTHERAPY

—	Group 1 — Localised peritonitis or slight peritoneal contamination			Group 2 — Grave general peritonitis or gross peritoneal contamination			Total — All cases of peritonitis or peritoneal contamination		
	C	D	F (%)	C	D	F (%)	C	D	F (%)
1939–40	85	9	10·6	18	10	55·5	103	19	18·4
1940–41	101	6	5·9	24	2	8·3	125	8	6·4

C = cases; D = deaths; F = fatality-rate.

One other comparison can be made. From September, 1939, to October, 1940, we had 11 deaths from general peritonitis in 143 cases of abdominal section. Since then in 161 cases we have had the two deaths from general peritonitis mentioned above.

METHOD OF APPLICATION

In all our cases sulphanilamide has been the only chemical placed in the peritoneal cavity. The recent experiments of Throckmorton (1941), however, suggest that sulphathiazole may prove to be slightly more effective, though just as innocuous to the peritoneum itself.

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Further experimental work is necessary before it can be assumed that it is safe to use sulphapyridine in the peritoneal cavity in clinical cases. In cases of grave general peritonitis we use 15–20 g. of sulphanilamide suspended in 60–70 c.cm. of saline and try to distribute this evenly over the peritoneum; this is not easy but can be accomplished satisfactorily if the following points are attended to.

When the surgeon is ready to sew up, the peritoneum should be sutured with a length of fine rubber tubing leading into the peritoneal cavity. This tubing should be of such a bore that it fits firmly on the nozzle of a 20 c.cm. record syringe. The sulphanilamide powder should now be placed in a small gallipot and covered with 60–70 c.cm. of saline and immediately stirred vigorously until a fine uniform suspension is obtained. Without delay, this suspension is injected with a record syringe through the rubber tube, which is then removed.

Suture of the peritoneum before injecting the suspension prevents some of the sulphanilamide leaking out while the surgeon is sewing up. Rapid stirring and injection of the powder is necessary because sulphanilamide, if covered with saline and left, settles into lumps which will not be taken up by the syringe, and which if inserted into the peritoneal cavity would not give the desired uniform distribution. In cases with an obvious focus of infection, such as a gangrenous appendix, this is dealt with according to established surgical principles, and the site is especially powdered with finely divided sulphanilamide. Drainage of the peritoneum is employed in these cases.

In cases of severe contamination of the peritoneum occurring in perforations of gut, gangrene from strangulation and so on, a suspension of 10–15 g. is used and danger points, such as a line of anastomosis, are powdered carefully. In cases where general peritonitis is considered possible but unlikely, such as acute appendicitis with local peritonitis or recent perforated peptic ulcer, a dose of 10 g. is used. In these cases drainage of the peritoneal cavity and postoperative chemotherapy are employed only when contamination is severe and the risk of general peritonitis great. Only cases with grave general peritonitis or gross peritoneal contamination received postoperative reinforcement. Of these, 7 cases were treated with intraperitoneal sulphanilamide plus postoperative sulphapyridine, with 1 death; 17 were treated with intraperitoneal sulphanilamide alone, also with 1 death.

Clearly a high concentration in the blood will be maintained for a longer period if the intraperitoneal dose is reinforced, and this may slow down absorption from the peritoneal cavity, though we have no evidence that it does.

The concentration of sulphanilamide attained in the blood is very variable. If the intraperitoneal dose is not reinforced postoperatively, we have found that a peak is reached in about 12 hours with a concentration of 7–12 mg. per 100 c.cm., the figure then dropping to zero at 36–48 hours. A peak of 20 mg. per 100 c.cm. or even higher may however be reached and absorption may continue up to 3 days. These figures agree with those recorded by Mueller (1941). If postoperative chemotherapy is employed the concentration of sulphanilamide plus sulphapyridine * in the blood may be maintained almost indefinitely at about 5–10 mg. per 100 c.cm. by a dose of 1 g. of sulphapyridine 6-hourly, the figure dropping to zero very rapidly on the cessation of chemotherapy. In one case we left at operation a capillary rubber tube leading into the peritoneal cavity, through which postoperatively a suspension of sulphanilamide was introduced. This procedure was abandoned on finding that it apparently produced pain.

Blood concentrations of sulphanilamide and of sulphanilamide plus sulphapyridine in some of our cases are shown in figs. 1 and 2. In fig. 1 intraperitoneal sulphanilamide was supplemented by postoperative sulphapyridine, while in fig. 2 chemotherapy was limited to intraperitoneal sulphanilamide.

CASE-RECORDS

In the following illustrative cases intraperitoneal sulphanilamide seemed to contribute materially towards recovery. Two other such cases have already been recorded (1941).

CASE 1.—A man of 60, admitted with acute on chronic large-gut obstruction and a large palpable mass in the left iliac fossa. Operation (R. S.) revealed an extensive growth of the pelvic colon which had infiltrated into a loop of small gut. A preliminary colostomy was considered inadvisable, as it was thought that the small gut might become obstructed before the second operation. Accordingly, the whole mass was excised with a deep V of mesocolon. Primary anastomosis of the small gut was performed, and the large gut was dealt with by invaginating the stump of the terminal pelvic colon and bringing out the upper loop as a terminal colostomy. Careful powdering of danger points with sulphanilamide and the injection of a suspension of sulphanilamide in saline generally into the peritoneal cavity was followed by a convalescence uncomplicated by any trace of peritonitis.

In this case 15 g. of sulphanilamide was used in the peritoneal cavity and was supplemented by 1 g. of sulphapyridine intramuscularly 6-hourly for 48 hours starting 12 hours after operation. The resulting concentration in the blood is shown in fig. 1, curve 1.

CASE 2.—A man of 34, admitted two months after a laparotomy at another hospital for a strangulated internal hernia treated by simple release. The strangulated loop had proved not viable, but fortunately when the wall of the gut sloughed an external fistula developed through the wound. Six weeks with a fistula of his small gut left him with a severe excoriation of the skin of his abdomen extending from the costal margins to the inguinal ligaments, while dehydration and emaciation were extreme. Careful attention was given to his nutritional needs and particularly to his fluid-balance chart, fluid intake by mouth at first being supplemented by intravenous drip saline. A catheter inserted into the fistula was connected to a continuous suction apparatus in order to divert as far as possible the extremely alkaline intestinal contents from the skin of the abdominal wall, which was dressed with an ointment containing 5% hydrochloric acid. After 5 weeks the abdominal skin was healed, except for a very small circle round the fistula. The patient was gaining weight and his general condition was much improved. The abdomen was explored (R. V. H.) through a new incision through normal skin. A one-stage resection of the fistula and the loop of small gut concerned was followed by a primary intestinal anastomosis. Convalescence was rapid and free from any trace of peritonitis.

In this case 10 g. of sulphanilamide was used in the peritoneal cavity and was supplemented by 1 g. of sulphapyridine intramuscularly or by mouth 6-hourly for 3 days, starting 12 hours after operation. The resulting concentration in the blood is shown in fig. 1, curve 2.

CASE 3.—A man of 47, operated on (R. S.) for acute pancreatitis. Drainage of the peri-pancreatic tissue was carried out and 15 g. of sulphanilamide implanted in the peritoneal cavity. Further operative procedures were considered inadvisable because of the patient's poor condition, although stones were felt in the gall-bladder. A swab from the necrotic peri-pancreatic tissues gave a pure culture of *Bacterium coli*. The patient made a good recovery, but later cholecystectomy was advised, in view of the stones felt at operation and a cholecystogram confirming chronic cholecystitis and cholelithiasis. Before this could be performed the patient was readmitted for the sudden onset of obstructive jaundice. At a second laparotomy (R. V. H.) it was particularly noticed that the abdomen was free from adhesions of any consequence and it was clear that the acute pancreatitis could not have been followed by peritonitis of any severity. Cholecystectomy and removal of stones impacted in the ampulla of Vater was followed by the insertion of a T tube into the common bile-duct and the implantation of 10 g. of sulphanilamide into the peritoneal cavity. A swab from the lumen of the common bile-duct again gave a pure culture of *Bact. coli*. At the end of 10 days a cholangiogram, by means of 'Lipiodol' injected directly into the T tube, demonstrated a biliary system free from obstruction and the T tube was then removed. Convalescence was again rapid and complete.

CASE 4.—A woman of 39, admitted with acute pancreatitis and a urinary diastase of over 200. At operation (R. S.) the peri-pancreatic tissue was drained, a gall-bladder full of stones was removed, the common bile-duct was drained with a T tube and 10 g. of sulphanilamide was implanted into the peritoneal cavity. There was also considerable intestinal dilatation due, it is thought, to splanchnic irritation from the

* The same colorimetric estimation was employed for sulphanilamide and sulphapyridine, so that where both were used blood estimation gave the sum of the two, or the total effective fraction.

extreme retroperitoneal digestion. Postoperatively this was treated by continuous nasoduodenal suction for 9 days. The patient made a good recovery.

The postoperative concentration of sulphanilamide in the blood is shown in fig. 2, curve 1.

CASE 5.—A woman of 40, admitted with general peritonitis of unknown ætiology of 3 days' duration. She was very ill and dehydrated, with extreme generalised abdominal rigidity, a pulse-rate of 140, and profuse effortless vomiting of dark brown intestinal contents. Warmth, morphia, gastric suction and an intravenous drip saline preceded laparotomy (R. S.) under local field block and light cyclopropane anæsthesia, which revealed a gangrenous appendix and general peritonitis. Appendicectomy was followed by the insertion of 15 g. of sulphanilamide and drainage of the peritoneal cavity. Postoperative continuous gastric suction contributed to a satisfactory convalescence, complicated only by a *Bact. coli* cystitis. A swab taken at operation from the peritoneal fluid had failed to demonstrate this organism, cultures proving sterile though the direct smear showed numerous polymorphs.

In this case intraperitoneal sulphanilamide was supplemented by 1 g. of sulphapyridine intramuscularly 6-hourly for 48 hours, starting 12 hours after operation. The resulting concentration in the blood is shown in fig. 1, curve 3.

CASE 6.—A woman of 25, operated on (R. S.) for general peritonitis and gangrenous appendicitis. On opening the abdomen purulent fluid poured out from a peritoneal cavity devoid of any trace of localising adhesions. A swab gave a culture of *Bact. coli* and *Streptococcus fæcalis*. Treated by appendicectomy, 10 g. of intraperitoneal sulphanilamide and postoperative continuous gastric suction, she made a good recovery.

The postoperative concentration of sulphanilamide in the blood is shown in fig. 2, curve 2.

CASE 7.—A very obese bronchitic woman of 45 was under treatment in the hospital for a varicose ulcer when she was seized suddenly with severe generalised abdominal pain with diffuse rigidity and tenderness. Physical signs suggesting consolidation at both bases and a respiration-rate of 35 made one wonder whether the abdominal pain and rigidity were referred from the thorax, but a plain radiogram showed gas under the diaphragm. Laparotomy (R. S.) under local field block and light cyclopropane anæsthesia revealed a perforated diverticulitis with free fæces in the peritoneum. Suture of omentum over the perforation was followed by transverse colostomy and the implantation of 15 g. of sulphanilamide into the peritoneal cavity, which was drained by strips of corrugated rubber. Postoperatively her chest gave rise to anxiety for some days, but apart from this convalescence was uneventful.

CASE 8.—A man of 43, admitted with very severe generalised abdominal pain and such extreme rigidity that his doctor had sent him into hospital with a diagnosis of perforated gastric ulcer. The key to the diagnosis was the character of the pain, which had begun gradually 24 hours previously as a diffuse ache, had then become localised to the right iliac fossa and abated somewhat, and had finally become generalised again abruptly and with great severity 4 hours before admission. At operation (R. S.) large quantities of liquid intestinal contents poured out of the abdomen. A gangrenous perforated area about the size of a sixpence was found at the base of the appendix, amounting in fact to a perforation into the cæcum. The appendix was removed and the peritoneal cavity drained after the implantation of 15 g. of sulphanilamide. Postoperatively continuous gastric suction contributed to a rapid recovery.

CASE 9.—A man of 69, operated on (R. S.) for strangulated right femoral hernia ten years after a bilateral repair of inguinal herniæ had been performed elsewhere. Strangulation had apparently occurred only 12 hours before operation, but the loop of ileum concerned was gangrenous and perforated. Resection was followed by end-to-end anastomosis, the whole operation being performed through an inguinal incision. The line of anastomosis was then powdered with sulphanilamide and a suspension of sulphanilamide in saline was injected into the general peritoneal cavity, 15 g. being used in all. Closure of the incision and a Lotheisen repair was carried out without drainage. Recovery was rapid and uneventful.

CASE 10.—A man of 41 consulted his doctor with an increasing chronic obstruction in the ileo-cæcal region. He was given a barium enema and a barium meal which completely blocked what little lumen remained at the site of obstruction, and he was admitted to the Middlesex Hospital, acutely obstructed, vomiting barium and full of barium from mouth to anus. Preliminary decompression by continuous gastric suction preceded an exploratory laparotomy (R. V. H.), which revealed a ring carcinoma at the beginning of the ascending colon. A hemicolectomy was performed, followed by anastomosis of the ileum to the transverse colon. Intraperitoneal sulphanilamide and continuous postoperative gastric suction contributed to a smooth and rapid convalescence.

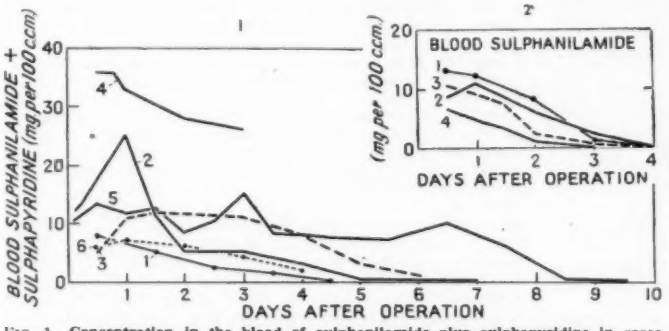
BLOOD SULPHANILAMIDE + SULPHAPYRIDINE (mg per 100 ccm)
DAYS AFTER OPERATION
BLOOD SULPHANILAMIDE
(mg per 100 ccm)
DAYS AFTER OPERATION

FIG. 1—**Concentration in the blood of sulphanilamide plus sulphapyridine in cases where intraperitoneal sulphanilamide and postoperative sulphapyridine have been used**

Curve 1—Resection of growth involving large and small gut in presence of acute intestinal obstruction (case 1); 15 g. of intraperitoneal sulphanilamide followed after 12 hours by 1 g. of sulphapyridine intramuscularly 6-hourly for 48 hours.

Curve 2—Resection of fistula of small gut (case 2); 10 g. of intraperitoneal sulphanilamide followed after 12 hours by 1 g. of sulphapyridine intramuscularly 6-hourly for 3 days.

Curve 3—Gross general peritonitis (case 5); 15 g. of sulphanilamide followed after 12 hours by 1 g. of sulphapyridine intramuscularly 6-hourly for 48 hours.

Curve 4—Gross general peritonitis; 20 g. of intraperitoneal sulphanilamide followed after 12 hours by 1 g. of sulphapyridine intramuscularly 4-hourly for 48 hours.

Curve 5.—Resection of strangulated gangrenous gut; 15 g. of intraperitoneal sulphanilamide followed after 24 hours by 1 g. of sulphapyridine intramuscularly 6-hourly for 6 days.

Curve 6—Gross general peritonitis in girl of 16 years; 5 g. of intraperitoneal sulphanilamide, followed after 24 hours by further 5 g. intraperitoneally through rubber tube and similar dose after 36 hours. Thereafter 1 g. of sulphapyridine given intramuscularly 6-hourly for 36 hours.

FIG. 2—**Concentration in the blood of sulphanilamide after intraperitoneal sulphanilamide only**

Curve 1—Acute pancreatitis (case 4); 10 g. of intraperitoneal sulphanilamide.

Curve 2—Gross general peritonitis (case 6); 10 g. of intraperitoneal sulphanilamide.

Curve 3—Perforated gastric ulcer; 15 g. of intraperitoneal sulphanilamide.

Curve 4—Acute appendicitis with local peritonitis; 10 g. of intraperitoneal sulphanilamide.

Other figures for the concentration of sulphanilamide in the blood after intraperitoneal sulphanilamide have already been published (Hudson, Smith and Selbie 1941).

DISCUSSION

Intraperitoneal sulphanilamide seems to us to have proved an extremely valuable weapon in the treatment of potential or established peritonitis. Yet however effective this detail in the treatment of peritoneal infection may be, the best results will only be obtained by combining it with careful attention to preoperative preparation, operative technique, choice of anæsthetic, and postoperative care. The importance, for instance, of continuous suction drainage of the small gut by means of a gastric, duodenal or intestinal tube in cases of intestinal obstruction can hardly be overestimated. Apart from the question of peritonitis, it seems a reasonable assumption that the production of a high concentration of sulphanilamide in the blood-stream soon after operation should reduce the incidence of postoperative pneumonia and urinary infections. It has been a disappointment that the high dosage used in our series has not always prevented these complications.

The value of postoperative reinforcement of intraperitoneal chemotherapy

is extremely difficult to assess. We have given a post-operative course of sulphapyridine to a small number of cases, but are by no means satisfied that this is necessary or beneficial. Certainly our results when using intraperitoneal sulphanilamide plus postoperative sulphapyridine have been no better than those with intraperitoneal sulphanilamide alone. Our series is, however, too small to make any dogmatic pronouncement, and further work is necessary to elucidate this point.

Bearing in mind the large doses of sulphanilamide employed and the rapid absorption from the peritoneal cavity, it is hardly surprising that the patient usually exhibits, for a day or two, signs of sulphanilamide intoxication. If not expected, the dusky hue of the patient for 24–48 hours after operation may prove alarming. Nevertheless, we have had no case in which symptoms caused by the sulphanilamide have given rise to anxiety, nor have we noticed a fall in the white-cell count of any patient which could not be explained by the elimination of a focus of infection. This agrees with the prevalent view that serious toxic manifestations are more likely to follow the administration of moderate dosages continuously over a long period than one large dose. Jackson and Coller (1942) mention the frequency with which jaundice was noted when intraperitoneal sulphanilamide was combined with postoperative administration by mouth. No cases of jaundice which can be attributed to the treatment have been observed in our own cases.

Further work on the subject of intraperitoneal sulphanilamide is still necessary. New chemotherapeutic agents may be combined with, or may replace, sulphanilamide, and results may be still further improved by progress in the technique of both intraperitoneal chemotherapy and suction drainage.

SUMMARY

Since October, 1940, we have employed intraperitoneal sulphanilamide in the treatment of peritonitis and peritoneal contamination, the average dose being 10–15 g. In most cases this was the only chemotherapy employed but in a few it was reinforced with sulphapyridine given by mouth or intramuscularly for two or three days after operation. It is not yet possible to say whether this postoperative reinforcement improves the prognosis.

From September, 1939, to October, 1940, intravenous and intramuscular chemotherapy was used on many cases with disappointing results and a fatality-rate of 55·5% in cases of grave general peritonitis or gross peritoneal contamination. Between October, 1940, and October, 1941, when intraperitoneal sulphanilamide was employed as a routine, the fatality in similar cases was reduced to 8·3%.

The use of continuous gastric, duodenal or intestinal suction drainage as an additional measure is strongly advocated.

Ten illustrative cases are described in which intraperitoneal sulphanilamide is thought to have contributed materially towards recovery.

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ROYAL SOCIETY OF MEDICINE.—On Tuesday, April 14, at 4.30 P.M., at the section of psychiatry of this society, there will be a discussion on testing intellectual capacity in adults. It will be opened by Dr. F. J. S. Esher, Mr. J. C. Raven and Dr. C. J. C. Earl. On April 15, at 2.30 P.M., the section of comparative medicine at the fourth meeting of their series on the control of diseases of cattle inimical to man will discuss brucellosis and sterility. The opening speakers are to be Mr. G. N. Gould, Mr. A. S. Parkes, F.R.S., and Mr. John Hammond, F.R.S. On April 17, at 2.30 P.M., Prof. G. W. Pickering will open a discussion at the section of physical medicine on physical medicine and the cardiovascular system. The section of neurology will meet on April 18 at the Wingfield-Morris Orthopædic Hospital, Oxford, at 1.15 P.M. Prof. H. J. Seddon will read a paper on the clinico-pathological classification of nerve injuries, Mr. W. B. Highet on dissociated paralyses and Dr. Graham Weddell on the histology of cutaneous innervation in man.

RADIOTHERAPY IN THE PROPHYLAXIS AND TREATMENT OF KELOID

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THE value of radiations in the prophylaxis and treatment of keloid is not so widely recognised as it should be, and it seems important at the present time to attempt to define their position in the treatment of these conditions. That the resolution of keloidal processes could be accelerated by means of radiations either from radium or X rays has been known for many years. In the past, surface radium therapy has been perhaps most commonly employed, with rather haphazard dosage, but X rays have also been widely used with dosage which, if not quite so haphazard, has varied greatly in different hands and has nearly always tended to be small.

The undoubted value of radiations in the treatment of the developed keloid, even with these inexact methods, suggested to one of us (H. D. G.) that if before an operation a dose of radiation was given to the proposed line of skin incision, and the incision made while the tissues were under the influence of radiation, the occurrence of keloid might be prevented. In 1930 some experiments were carried out with the object of evolving a technique which might achieve this object.

It was thought desirable in the first place to establish the optimum dose for the treatment of a developed keloid with as great accuracy as possible. It was found that, with increasing radiation dosage, some improvement in the results was obtained until the neighbourhood of the erythema dose was reached. In this region of dosage the improvement in results was critical, and further experience has made it likely that the mild and controlled inflammatory reaction of which the erythema is the visible evidence is for some reason essential in securing the maximum resolution of the keloid. Since the erythema dose cannot be exceeded without risk of blistering and permanent marking of the skin, it was decided to adopt this as the optimum dose for keloid conditions.

A series of cases in which keloid might be expected to follow operation was therefore submitted to irradiation with this dosage, applied so as to be limited to the line of the proposed incision. The operation was then carried out during the period of active erythema—i.e., 5–10 days after the irradiation, since this was the period at which resolution began in the developed keloid. It was found that the incidence of keloid was reduced to almost negligible proportions by preoperative irradiation, although occasionally thickening did occur at a later stage of healing. For this reason, postoperative irradiation was tried in addition to the preoperative treatment, and there is little doubt that in cases in which the avoidance of the thickening is imperative the combination of pre- and post-operative irradiation is the best method of treatment. Moreover, since this entails the application of only a single dose of X rays before and one after the operation, and there are no local or constitutional reactions, the radiation treatment is in no sense an infliction on the patient.

Postoperative treatment alone has also been carried out in a number of cases and this method too has been found effective in preventing the appearance of keloid, though the results, particularly as regards the width of the resultant scar, are not so good as when treatment is given before and after operation. With either method, postoperative treatment is best carried out as soon as the stitches have been removed.

In all these cases, X rays have been used and not radium, because of the much greater ease and accuracy with which exact dosage could be delivered. In pre- and post-operative treatment, and for small keloidal scars, contact therapy has proved a convenient and effective method of application. For thicker scars, however, higher powered apparatus is necessary, and for the thickest scar masses, resulting especially from burns and scales, high voltage rays have been used as in

deep therapy, although by the use of a minimal focus skin distance the depth dosage is kept as low as possible.

INDICATIONS AND CONTRA-INDICATIONS

In the *prevention of keloid*, the method of choice is combined pre- and post-operative irradiation. Pre-operative irradiation may be impossible for various reasons, such as an emergency operation or uncertainty as to the precise incision line. In such cases, post-operative irradiation is carried out as soon as the stitches have been removed. Prophylactic irradiation should be carried out in all cases where (1) the patient is known to have a tendency to keloid formation; (2) when the incision is across the natural skin creases; (3) when an incision has to be made in thick skin; and (4) when there has been continued exposure of raw surfaces, as in burns.

Treatment of developed keloid.—Of the developed keloids, those that do best are the red fleshy type, however exuberant they may be. Indeed, the more exuberant they are, the more radiosensitive they tend to be, and per contra, the whiter the thickened scar the less likely is it to respond to radiation. Even the very hard "carapace" type of scar, which develops especially on the backs of the hands after burns and scalds but may also occur elsewhere, may give excellent results if treated with the right quality of ray and with sufficient persistence. It should be stressed, however, that for any very thick scar a period of up to eighteen months or more must be allowed before the full result is seen. Definite improvement should be produced in six months but the absorptive changes go on for much longer than this. On the other hand, when no improvement is observed after three months response to further treatment is unlikely if the dosage has been sufficient in the first instance. Well-developed white fibrous thickenings are usually completely radioresistant.

The sequence of events after irradiation of a typical and fleshy keloid is as follows. Until the appearance of the erythema, some five to ten days after the irradiation, no visible alteration takes place. But as soon as this reaction appears the scar begins to soften slowly. Over a period of months, the softening and absorption of the keloidal tissue goes on, and if left without further treatment the scar ultimately becomes replaced by a flat white area, which, it should be noted, in its superficial extent is equal to that of the original scar. That is to say, a wide scar is not narrowed by X-ray treatment although it is flattened and ultimately decolorised.

Contra-indications to radiation treatment are the presence of acute inflammatory conditions in the neighbourhood of the scar, such as boils or sepsis, and the presence of active tuberculous glands, or indeed of any considerable swelling underlying the scar in association with a history of tuberculous glands. A very important contra-indication to the use of anything but contact-therapy rays is an abdominal scar in a young woman, owing to the danger of damage to the ovaries. The use of buried wire sutures is best avoided when post-operative X rays are to be given, although their presence is not an absolute contra-indication to treatment.

METHOD

The important feature which is common to all the techniques that have been developed is the production of an erythematous reaction. The dose must be precisely localised to the keloid itself so that as little as possible healthy skin is exposed. For this purpose, the keloid is framed in a window made of pieces of lead-foil cut accurately to the outline of the scar. This part of the technique calls for the greatest possible care and may be very tedious. In the case of preoperative treatment, the proposed scar line is similarly outlined.

On the face, it is only permissible to produce the faintest degree of erythema lest a permanent mark be left. In other regions of the body it is permissible and even desirable to produce a fully developed skin reaction, for by this means a more rapid result is obtained and less subsequent treatment is needed.

The dosage required will depend on the area which has to be exposed and the region of the body. Facial scars are given about 10% lower dosage than scars on the body. The smallest scars, either small linear ones or rounded scars up to a few millimetres in diameter, may be given as much as 1500 r at the first exposure, the dose required to produce a well-marked erythema. Larger scars, say 1 cm. wide or 2 cm. in diameter for an irregular scar, require about 1000 r, while larger areas still are given 800–1000 r, according to size. No allowance has been made for back-scatter in computing these doses. There is no difference in the dosage whether contact therapy, medium therapy or higher voltages are used. With contact therapy several scars, of large total area may be covered at a single session. With the highest voltages, however, it is wise to limit the area treated to 100 sq. cm. with medium therapy (130–150 kV) and 50–75 sq. cm. with the highest voltages (200 kV) except on the abdomen where these figures should be halved. Treatment may be repeated as early as a month after the initial dose but it is better to wait six weeks. No more than two or three applications should be required except in the very hard, thick scars. In facial scars, a maximum of three doses in a year is advised.

Any reliable X-ray therapy apparatus which has been properly calibrated may be used in any of these techniques; contact-therapy apparatus is convenient but by no means necessary. Nor are voltages as high as 200 kV absolutely necessary, even in the hard thick formations. Where contact therapy of the Philips's type is being used, it is desirable to use a filter or not less than 1 mm. of aluminium in most cases, and a focus skin distance of 4 cm. is sufficient and convenient in practice. With ordinary superficial therapy and other types of therapy apparatus the minimum obtainable distance should be used. Appropriate filters should be used with the higher voltages, 0·3 mm. of copper would be suitable with 180 kV.

Reaction.—There is no constitutional reaction to the treatment as described unless large areas such as occur after extensive burns have to be treated by high-voltage rays, when observation of the dosage limits suggested should avoid any severe constitutional reaction. As regards local reaction, the number of cases treated runs well into four figures, and, in spite of the large dosage used, in no case has a burn or even a vesicating reaction been produced. In a few cases a well-marked erythema has appeared over a facial scar in spite of all precautions, but it is only in a very small proportion of cases that a permanent more or less faint stain will remain after the production of a well-marked erythema and so far as is known we have escaped this effect. So far as in known, too, telangiectases have not been produced in any case as a late result; certainly no patient has returned with telangiectases.

Great care has to be exercised in the case of scars in the neighbourhood of the eye lest the globe should be exposed to these large doses. Another important point is the protection of the eyebrows and the hair follicles of the scalp as closely as possible when scars in these localities are being irradiated, but no difficulties should be encountered if due care is observed.

An interesting application of the method is in association with plastic surgery in the repair of old X-ray injuries. The method can be used with safety even in these cases if the strictest possible care is exercised in the localisation of the rays to the scar lines.

After-treatment is mainly negative, consisting in the avoidance of all forms of irritation rather than in the application of active measures. Irritation from friction, such as from collars and clothes, and chemical irritation from cosmetic preparations, must be avoided. Even more important is the avoidance of exposure to direct summer sunlight. The combined effects of X rays and ultraviolet radiation may result in a burn if this precaution is not observed. Massage is best avoided after irradiation, although there are conditions in which the need for massage will have to override this contra-indication. In a certain number of cases, irritation is complained of and this may be met by the application of a simple starch power or a zinc oxide, bismuth and starch powder. Fatty or oily preparations are best avoided as these tend to perpetuate the erythema and may eventually result in a stain.

WAR EXPERIENCE

The greater number of war-injury cases coming for treatment fall under two headings—multiple small

splinter injuries due to high explosive, and massive keloidal scarring following burns and scalds. Experience in the first group shows that the scars resulting from these injuries, when they become keloidal, respond satisfactorily to radiation. Many of these cases have been given postoperative X rays after multiple excisions of small foreign bodies. The results have not been quite so satisfactory as in the simpler type of cases met in civilian life, for, although the formation of typical keloids is infrequent after irradiation, a somewhat thick and nodular scar is not at all uncommon, due probably to fibrosis around small foreign bodies. The value of irradiation in this group is purely cosmetic, and since in some cases of multiple injuries to a limited area improvement of individual lesions can make little difference to the general cosmetic effect, the patient and the X-ray therapy department may be spared much unnecessary treatment.

In the second group, the keloids following burns and scalds, extensive dense masses of keloidal tissue may seriously limit the movement of joints, either by loss of elasticity or even by simple mechanical obstruction. These are the scars in which higher voltages are necessary, not less than 130–140 kV. Full dosage has to be repeated once or twice at intervals of several weeks and very gratifying results are obtained. Considerable mobility has been restored in many instances to joints whose movement had been almost completely restricted. In one case in which the hand and finger joints were almost immobilised in extension as a result of acid burns on the backs of both hands, and in which repeated grafts had become heavily keloidal, irradiation resulted at the end of a year in the restoration of a high degree of mobility to all the joints.

Apart from the treatment of typical keloid, a certain number of cases have been treated for deep scarring and contractures. High voltage has been used in nearly all these cases and the result has been encouraging. There may possibly be a field in the realm of orthopædic surgery for the use of radiotherapy in the prophylaxis of deep scarring and contractures.

SUMMARY

The value of X-ray and radium therapy in the treatment of keloid has been known for many years and a method is here described by which the occurrence of keloidal thickening in operation scars can be avoided in the majority of cases.

Ideally, the method consists in the application of a single preoperative and a single postoperative dose of X rays. Experience in the treatment of developed keloid showed that the most effective dose lay in the neighbourhood of skin-erythema dose and this is the dose recommended in prophylaxis.

Prophylactic radiotherapy is indicated in all operation cases where patients are known to have a tendency to keloid formation, where the incision is across the natural skin creases, or has to be made in thick skin, or where there has been continued exposure of raw surfaces, as in burns.

Contra-indications are the presence of sepsis, active tubercular glands and abdominal scars in young women, unless contact therapy is available.

Methods of treating developed keloid are also discussed.

Correct voltage and technique are important.

No special apparatus is required, and although contact therapy is a convenient method of treatment for the smaller scars and for prophylaxis cases, it is by no means essential. Any reliable X-ray therapy apparatus will serve provided it is accurately calibrated.

TYPHUS IN GERMANY.—At a meeting of the Medical Society of Leipzig on Nov. 25, 1941, speakers mentioned that typhus has appeared among the foreigners and prisoners of war working in the Reich, and Luz reported an epidemic in which Germans as well as Poles were attacked. The Poles were only lightly affected and most cases were ambulant, whereas the Germans suffered more severely. The high fatality among the Germans was ascribed to their complete lack of immunity, while the Poles are to some extent naturally immunised.

CHANCES OF RESUSCITATION
AFTER AN OVERDOSE OF ETHER, DIVINYL ETHER AND CHLOROFORM

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AN anæsthetic death may be regarded as the end-result of two successive accidents. First a potentially lethal overdose is administered, and afterwards there is failure to resuscitate. The varied and complicated circumstances which always surround death under anæsthesia usually provide a plausible explanation for the tragedy, but in the final analysis the same ultimate cause can be seen to have operated: there was failure to resuscitate. Safety in anæsthesia, therefore, depends to some degree on success in resuscitation.

During the 95 years that inhalation anæsthetics have been available a great deal of experimental work has been done with the object of determining the "margin of safety," or the relationship between the effective and respiratory arresting doses. But the conventional margin of safety cannot be regarded as an adequate guide to the probable clinical mortality, because it is concerned only with the probability of overdose. To complete the pharmacological analysis it is necessary to take into account the probability of death in the event of overdose. This latter aspect of the toxicity of the anæsthetics depends on a quite separate group of pharmacological properties from those responsible for the margin of safety. A study of the margin of safety alone, therefore, is not sufficient because it does not reveal the degree to which the individual inhalation anæsthetics possess the valuable quality for which we propose the term "resuscitability." Although certain of the properties which make resuscitation possible—such as the effect of the drug on the various components of the circulatory system and the rate of its elimination—have been intensively studied, no-one so far as we are aware has made a systematic attempt to determine the probability of resuscitation from a standardised lethal dose of an inhalation anæsthetic.

TECHNIQUE AND RESULTS

Doses of ether, divinyl ether and chloroform, measured per kg. body-weight, were administered to dogs by the method described in an earlier paper (Draper and Whitehead 1938). The apparatus employed consists of a closed soda-lime absorption system, having a capacity of approximately 5·5 litres, within which the anæsthetic is rapidly volatilised in an atmosphere of pure oxygen. The dose given was the minimal amount required to produce an apparently permanent respiratory arrest in the particular dog used in at least 2 out of 3 consecutive administrations, and which, when reduced by 10%, produced arrest in not more than 1 of 3 consecutive administrations. By this means the dose was assessed for each dog in the series. When volatile anæsthetics are administered in this way the animal passes through all the stages of anæsthesia to medullary paralysis with great rapidity. This technique is essentially that of the old "Rausch" (Coughlin 1911) modified by the addition of an excess of oxygen and by the use of soda-lime to prevent accumulation of carbon dioxide. There is also a close resemblance between our technique and the brusque induction of anæsthesia which may become necessary under the stress of battle conditions. A good correlation between the dose administered and the resulting depth of anæsthesia is obtained by this simple method of administration (Draper and Whitehead 1938, Whitehead and Draper 1939, 1942). After the respiratory paralysis had lasted 10–15 sec. the mask was removed and the dog was resuscitated by artificial respiration and the administration of oxygen. All experiments were conducted by a standardised technique which made them identical to each other with the exception of the anæsthetic used. In this type of investigation the experimental procedure must be standardised in order to ensure the accumulation of data uncomplicated by

variations in skill and technique which will therefore reflect only the inherent resuscitability of the three anæsthetics.

The data obtained in the course of 600 resuscitations from apparently permanent respiratory arrest are summarised in the table.

RESUSCITABILITY OF ETHER, DIVINYL ETHER AND CHLOROFORM

Anæsthetic	No. of dogs	Median dose* in c.cm. per kg.	Respiratory arrests produced	Failures to resuscitate
Ether ..	62	1·69	250	2 (0·8%)
Divinyl ether	61	0·68	137	4 (2·9%)
Chloroform	69	0·18	213	22 (10·3%)

* The range of the doses required to produce respiratory arrest was, for ether 0·97–3·3 c.cm. per kg., for divinyl ether 0·5–1·24 c.cm. per kg., and for chloroform 0·11–0·275 c.cm. per kg.

DISCUSSION

The contrast between ether and chloroform from the point of view of resuscitation is significant. In our experiments death was more than ten times as likely to result from an overdose of chloroform as from ether. It is safe to assume a priori that, if an anæsthetic is seriously deficient in resuscitability, then its clinical use will entail an unduly high mortality. The fact that chloroform is more dangerous than ether has of course been recognised for many years. There are, today, comparatively few who would maintain that under equal conditions of skill and care in administration chloroform is the safer. Yet this simple and easily proven fact was learned only a posteriori and after many decades of clinical observation, millions of anæsthesias and the needless sacrifice of an unknown number of lives. It is therefore pertinent to ask why this should have been so and if today the evaluation of proposed new anæsthetics is conducted in a satisfactory manner. We believe that much of the controversy and uncertainty concerning recently introduced agents is unnecessary, and could be avoided by a more thorough preliminary pharmacological study, including study of the property of resuscitability, and by better provision for the systematic collection of clinical data.

Divinyl ether is one of the newer anæsthetics which is still in the process of evaluation. Our experiments with this drug resulted in 4 deaths or a 2·9% failure rate in 137 attempts to resuscitate from respiratory arrest. The series is too small to warrant a dogmatic statement, but it does provide a strong suggestion that the resuscitability of divinyl ether is less than that of ether. The inferiority of chloroform to both these agents is clearly indicated.

Resuscitation from an overdose of an inhalation anæsthetic is made possible by the fact that respiratory arrest develops before failure of the circulation. The period which separates respiratory arrest from circulatory failure might be termed the "resuscitation interval," because it is only during this interval that an attempt at resuscitation is likely to be successful. The issue of life and death, therefore, is determined by the direction which physiological events can be induced to take during this brief but critical period. Our experience with many hundreds of resuscitations has impressed us with the importance of the following general considerations.

Length of resuscitation interval.—If other influences remain equal the advantage will lie with the anæsthetic which provides the longest interval between respiratory arrest and circulatory failure. The behaviour of the circulation after respiratory arrest is the determining factor here. There is little doubt that chloroform is inferior in this respect.

Vigour of the circulation.—Forced ventilation of the lungs after respiratory arrest replenishes the oxygen supply within the alveoli and lowers the tension of the anæsthetic in the respiratory passages. This alone will not ensure resuscitation. For success there must be sufficient circulatory volume per minute to provide effective transport of gases between the lungs and body tissues. Unless this is so the concentration of the anæsthetic in the body tissues will not be reduced and anoxæmia will continue to deepen until death results. The most efficient artificial respiration, therefore, cannot save a patient whose circulation lacks the necessary vigour. From the point of view of the vigour of the circulation at the time of respiratory arrest, chloroform is inferior to both ether and divinyl ether.

Rate of elimination.—It is obvious that the more rapidly an anæsthetic can be eliminated by forced ventilation of the lungs the greater are the chances for resuscitation. Again chloroform is decidedly inferior and resuscitation from an overdose is correspondingly slow. In contrast, divinyl ether is very rapidly eliminated and resuscitation is, in most instances, very easy. The ease and speed of resuscitation from divinyl ether, however, is apt to be deceptive and should not be regarded as a certainty. Resuscitation from ether overdose in our experience was more certain.

Synergism between anoxæmia and the circulatory toxicity of anæsthetics.—Although respiratory arrest, in nearly all instances, occurs before the concentration of the anæsthetic is sufficient of itself to cause failure of the circulation, unfortunately it is rapidly followed by the development of anoxæmia. The ultimate failure of the circulation is thus due to a synergistic action between the deepeping anoxæmia and what might otherwise be a non-lethal concentration of the anæsthetic. The implication of this fact is clear. Every effort should be made to prevent anoxæmia during anæsthesia if only because the presence of anoxæmia at the time of respiratory arrest greatly prejudices the chances of resuscitation. The antidotal action of high concentrations of oxygen against the circulatory toxicity of anæsthetics is illustrated by our experience with chloroform. In the course of our experiments, we have administered approximately 500 toxic doses of chloroform by a very brusque method in which all the established principles of safe administration were violated, and yet in only one instance was primary cardiac collapse observed. In all other cases the animals proceeded to respiratory arrest through the regular sequence of the stages of anæsthesia. This is in remarkable contrast to the commonness of cardiac collapse when chloroform is very rapidly and carelessly administered to dogs by the conventional drop method. It seems evident that the use of pure oxygen instead of air as a volatilising medium served to protect the heart from the usual toxic effects of chloroform.

Adductor spasm of the cords is often responsible for failure to resuscitate. Our experience with nearly 1000 resuscitations has impressed on us that the first step in resuscitation should be the establishment of a patent airway.

Food in the stomach may be a serious handicap to resuscitation. In our early experiments the dogs were allowed free access to food. As a consequence many of the animals anæsthetised had recently eaten. When such dogs are subjected to the manipulations of artificial respiration while in a state of complete relaxation the contents of the stomach are apt to be forced into the pharynx. Death from acute asphyxia often results. In the experiments reported here the animals were deprived of food for 12 hours before the administration of the anæsthetic.

Limitations of analeptics.—In two earlier papers (1939, 1941) we reported experiments dealing with the usefulness of nikethamide ('Coramine') and leptazol (metrazol) as aids to resuscitation from an overdose of these three anæsthetics. We obtained some evidence of a favourable action by leptazol but nikethamide appeared to be useless or even harmful. In any case no analeptic is known which is capable of producing prompt and certain ventilation of the lungs in a subject in a state of respiratory paralysis. The most important thing in resuscitation, therefore, is to begin artificial respiration.

SUMMARY

Previous studies of the toxicity of anæsthetics have been concerned mainly to determine the margin of safety. To complete the pharmacological analysis it is necessary to take into account the probability of death in the event of overdose.

Studies have been made of the effects of anæsthetics on the circulatory system and the rate of elimination, but there has been no systematic attempt to determine the probability of resuscitation from a standardised lethal dose of an inhalation anæsthetic. We have tried to accomplish this with ether, divinyl ether and chloroform.

Respiratory arrest was induced in dogs by giving measured doses of the anæsthetic (graded according to

body-weight) volatilised within a closed soda-lime absorption system; attempts were then made to revive the animals by artificial respiration and oxygen. A rigid technique was used throughout.

Data from 600 cases were as follows: after 250 respiratory arrests produced by ether there were 2 (0·8%) failures to resuscitate; after 137 arrests produced by divinyl ether there were 4 (2·9%) failures; after 213 arrests produced by chloroform there were 22 (10·3%) failures. Thus respiratory arrest produced by chloroform is much more likely to prove fatal than that produced by ether or divinyl ether.

Resuscitation after an overdose of an inhaled anæsthetic is made possible by the fact that respiratory arrest develops before circulatory failure. We have termed the period separating respiratory arrest from failure of the circulation the resuscitation interval because it is only during this interval that resuscitation is likely to be successful. The longer this interval is the greater is the probability of resuscitation.

Unless the circulatory volume per minute at the time of respiratory arrest is sufficient to provide effective transport of gases between the lungs and body tissues artificial respiration will not be effective.

In general, rapid elimination of an anæsthetic is associated with rapid recovery from overdose, but mere speed of elimination is not synonymous with certainty of resuscitation.

Anoxæmia is synergistic with the toxicity of anæsthetics. Thus satisfactory oxygenation at the time of respiratory arrest favours resuscitation. Spasm of the vocal cords or food in the stomach (which may be expelled into the pharynx during artificial respiration) may prevent adequate ventilation of the lungs by artificial respiration and seriously prejudice the chances for resuscitation.

Analeptics in general are uncertain stimulants of the paralysed respiratory centre and in fact may do harm. The most important method of treating respiratory arrest is prompt artificial respiration, supplemented by oxygen.

The divinyl ether used was supplied by Merck and Co., Rahway, N.J.

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PNEUMOCOCCAL MENINGITIS IN AN INFANT

RECOVERY WITH SULPHAPYRIDINE

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PNEUMOCOCCAL meningitis, before the introduction of modern chemotherapy, was almost always fatal. Since the introduction of sulphonamide therapy, however, many cases successfully treated have been reported. Most of the recoveries have been in adults and older children; only a very few have been reported in infants. The following case of pneumococcal meningitis in an infant was successfully treated with sulphapyridine.

CASE-REPORT

A male infant aged 17 months was admitted to the Highgate Hospital on Aug. 31, 1941. There was no history of any previous illness. For a week before admission he had had a mucoid discharge from the right nostril and on Aug. 30 he began to vomit, became drowsy and developed convulsive movements. Next day he had become drowsier, and finally comatose. On admission he was almost moribund; temperature 103° F., pulse-rate 172, respirations 46. He was comatose, with occasional twitchings of the whole body associated with piercing cries. There was slight neck-rigidity, with the head persistently turned to the right side, but Kernig sign was negative. The anterior fontanelle was still patent and not bulging. The pupils were dilated, the ocular fundi normal, and findings in the central nervous system were otherwise negative, except for a doubtful weakness of the right arm. The right eardrum was slightly dulled. Heart, lungs and abdomen seemed normal. A diagnosis of meningitis was made, and lumbar puncture performed. The cerebrospinal fluid, which was at a pressure of 270 mm. CSF, contained over 2000 white cells per c.mm. (90% polymorphs). A film showed numerous gram-positive encapsulated diplococci, none of which were intracellular. Culture gave a pure growth of pneumococci.

Sulphapyridine was started soon after admission; and as soon as the diagnosis was established it was decided to continue the sulphapyridine in larger doses than usual owing to the known bad prognosis of pneumococcal meningitis. He was given an initial dose of 1 g. by mouth, followed by another 1 g. after two hours, and then 0·5 g. four-hourly. Within 24 hours the temperature had begun to fall and the general condition to improve, but neck-rigidity persisted,

CSF FINDINGS

Date	On withdrawal	White cells per c.mm.	White cells Polymorphs %	White cells Lymphs %	Pneumococci in CSF
Aug. 31	Very turbid	2000 +	90	10	+ +
Sept. 3	Faintly turbid	1450	55	45	+
,, 5	Almost clear	210	25	75	−
,, 10	Clear	41	5	95	−
,, 11	Very turbid	5300	90	10	+ +
,, 16	Clear	66	25	75	−
,, 18	Clear	73	30	70	−
,, 21	Faintly turbid	6000	95	5	+ +
,, 27	Clear	110	25	75	+
,, 30	Clear	71	10	90	−
Oct. 7	Clear	32	5	95	−
,, 22	Clear	20	−	100	−

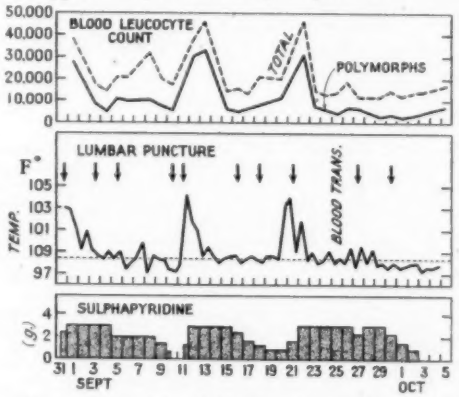
Kernig sign had become positive, and the weakness of the right arm was more definite. By Sept. 3 he was much improved, and the temperature was nearly normal (see chart), but there was still some evidence of meningitis and a mild stomatitis had developed. The CSF still contained pneumococci. In view of the persistence of the nasal discharge and continual rubbing of the face in the region of the left eye, an attempt was made to find some focus of pneumococcal infection in the sinuses, but X ray of the sinuses and skull was negative. An X ray of the chest was similarly negative, and a swab from the nasal discharge did not contain pneumococci. The general condition continued to improve, and the CSF on Sept. 5 contained only 210 white cells (25% polymorphs) per c.mm., and was sterile. On Sept. 9 it was thought safe to reduce the dosage of sulphapyridine to 0·25 g. six-hourly. Next day the temperature was normal, but he was still extremely irritable and there was still some neck-rigidity. Lumbar puncture revealed a clear sterile fluid, with 41 white cells (chiefly lymphocytes) per c.mm. Sulphapyridine was therefore discontinued, a total of 24·5 g. having been administered over a period of ten days.

After withdrawal of the drug the clinical condition improved slightly, but after 24 hours (Sept. 11) he relapsed. The temperature rose to 104·2° F., pulse-rate 160, respirations 60. The child was again extremely ill, very drowsy and irritable, with increased neck-rigidity. The eardrums were normal, and the chest clear. Lumbar puncture revealed fluid more turbid than at the onset of the illness, with 5400 white cells (90% polymorphs) per c.mm., and numerous pneumococci both in the gram film and on culture. Sulphapyridine was immediately recommenced, 0·5 g. being given four-hourly; and within 36 hours the temperature had fallen and the general condition had improved, although there were still signs of meningitis. This improvement continued, and the CSF on Sept. 16 was clear, sterile, and contained 66 white cells per c.mm. The sulphapyridine was therefore reduced to 0·25 g. four-hourly, although the infant was still very irritable. A further reduction to 0·25 g. t.d.s. was made on Sept. 18. Within 48 hours he relapsed for the second time (Sept. 20) and the temperature rose to 104° F., pulse-rate 168, respirations 56. The general condition was once more grave, and the CSF showed an increase in the number of white cells and many pneumococci. There was no choice but to increase the dosage of sulphapyridine again to 0·5 g. four-hourly, and there was once again an immediate improvement; the temperature subsided within 36 hours, and the signs of meningitis gradually disappeared. There was still weakness of the right arm, and still some nasal discharge.

Meanwhile, although iron had been administered since Sept. 12, he was very pale, and the hæmoglobin remained about 40–50%. On Sept. 25, 250 c.cm. of his mother's blood was given by slow drip transfusion. This was followed by definite clinical improvement. Lumbar puncture on Sept. 27

revealed clear fluid, with 110 white cells (chiefly lymphocytes) per c.mm.; but the gram film still showed some pneumococci, although culture was negative. On Sept. 30 the child was still irritable, and his right arm weak. X ray of the chest at this time was again negative, and Mr. Archer Ryland found no focus of infection in the ear, nose or throat. The CSF showed a further reduction in white cells and was sterile. The dosage of sulphapyridine was reduced, the general condition remained remarkably good, and the sulphapyridine was finally discontinued on Oct. 2. During the second course 49·5 g. were given over 22 days, and the total quantity administered over 32 days was 74 g. After withdrawal of the drug, the child continued to improve rapidly, and by Oct. 7 there was no sign of meningitis. The CSF was clear with 32 white cells (95% lymphocytes) per c.mm., and sterile. The weakness of the right arm had almost completely recovered, though he showed a disinclination to use the right hand. When transferred to convalescent home on Oct. 23 he was perfectly well, bright and playful.

Blood changes.—Daily examinations of the blood were performed throughout the illness (see chart). The first gave a polymorph count of 27,740 per c.mm. This gradually fell to the region of 4000–5000, but rose again at the first relapse to 30,000–33,000 per c.mm. The polymorphs fell to 5230 as the condition improved, but at the second relapse they rose again to 31,280 per c.mm. After this in spite of long and heavy dosage with sulphapyridine the polymorph count never fell below 2240 per c.mm. Throughout almost the entire illness, primitive white cells were present in the peripheral blood and from Sept. 5 onwards, the proportion of metamyelocytes varied from 2% to 6% of the total white-cell count. There was thus evidence of much marrow regeneration to compensate for the destruction of cells by the toxæmia and possibly by the sulphapyridine. Similar marrow hyperactivity was shown by the presence of nucleated



red cells in the peripheral blood; the number seen while counting 200 white cells varied from 2 to 7. There were also varying degrees of polychromasia, punctate basophilia and anisocytosis and poikilocytosis. The hæmoglobin level had fallen by Sept. 10 to 48% and ferri et ammon. cit., gr. 15 daily, was begun. Until Sept. 24, the hæmoglobin varied from 42 to 50%, but after the blood-transfusion on Sept. 25, it gradually rose until on discharge it was 80%.

DISCUSSION

Pneumococcal meningitis is usually divided into two classes—primary and secondary. The secondary cases are associated with a pneumococcal focus elsewhere, usually an otitis, sinusitis, mastoiditis, thrombosis of lateral sinus, or pneumonia. Pneumonia, of course, may also occur secondarily in a primary pneumococcal meningitis. The primary cases are those in which no preliminary focus is discoverable, and one can only assume that the pneumococcus enters the circulation through some minor nasopharyngeal lesion. Neal and his colleagues (1940) have shown that in many so-called primary cases coming to autopsy, undiagnosed sinusitis (particularly of the relatively inaccessible ethmoid and sphenoidal sinuses) is often discovered. Grossman (1940) affirms that half the total cases are primary, but this applies more particularly in adults. In the young primary cases are very uncommon.

Before the introduction of sulphonamides, the fatality from the disease in young children was almost 100%. I have been able to find reports of only 4 cases of spontaneous recovery from pneumococcal meningitis in children under the age of 5 years in presulphonamide times (Hall 1923, Uhr 1929, Ravenil 1936, Frankmann and Stewart 1937). The use of specific serum alone was responsible for occasional successful cases. But since the introduction of sulphonamides many cases have been successfully treated, mostly in adults and older children; the disease has remained extremely serious in children under 5 years (Cooke 1941). Up to the end of 1940, I can find reports of only 7 cases of recovery in children under 5 years treated with sulphonamides, and only 2 of these were under 2 years.

Young (1938) reports recovery of a child of 5 years treated with sulphanilamide alone, and Landon (1938) recovery of a child of 5 years treated with azosulphamide. Sherman (1940) treated a child of 2½ successfully with sulphapyridine, and Moore and Forbes (1940) a child of 5, who took 113 g. sulphapyridine. Grossman (1940), reporting 27 fatal cases in children, describes success in an infant at 3 months, who was given 94 g. of sulphapyridine and 44 g. of sulphanilamide, together with specific serum. Neal and his colleagues (1940) describe recovery in a child of 1¼ years, treated with sulphapyridine, and Dawnay (1940) recovery in a child of 4 years also treated with sulphapyridine alone. Recently, Howard (1941) reported a further case of recovery in an infant of a year treated with sulphathiazole.

All other reported cases under the age of 5 years treated with the sulphonamide group proved fatal; Steele and Gottlieb (1941), in a recent comprehensive statistical study of all reported cases in which chemotherapy had been used successfully, were not able to discover a single recovery in children under 2 years.

All observers agree that large doses of sulphonamides are essential, and a concentration of the drug in the cerebrospinal fluid of 8–10 mg. per 100 c.cm. is to be aimed at as soon as possible. Some therefore advocate the intravenous route to start with, but oral administration is to be preferred wherever possible, especially in infants who are more tolerant of the drug than adults. Only where the drug is not tolerated by mouth should parenteral injections be considered. Many, especially in America, advocate specific antipneumococcal serum in addition, but this necessitates typing the pneumococcus early and having the suitable serum available. In the present case no serum was administered. Of course, if there is any surgical focus of pneumococci, such as an otitis or sinusitis, this must be dealt with.

Two relapses occurred in this case, the first on withdrawing and the second on merely reducing the dosage of sulphapyridine; both the relapses happened after the CSF fluid had given a sterile culture. A similar condition has been noted by Raman (1939), Falla (1940) and Dawnay (1940). Dawnay described such a case in a child of 4 years in whom four exacerbations occurred at weekly intervals, each time after withdrawal of the drug, with eventual recovery. It is difficult to explain whence the organisms re-enter the CSF in these so-called primary cases, especially after the cerebrospinal fluid has been rendered sterile. In the present case the chest was clear, the ears were normal, and there was no evidence of mastoiditis or cranial bone infection; the mouth and pharynx were clear, and the sinuses unaffected. Nevertheless, the nasal discharge suggests that there may have been a focus of infection in the nasopharyngeal region which was not discovered. The paresis of the right upper limb suggests another possible explanation, in that there may have been a cortical or subcortical lesion, perhaps a superficial thrombophlebitis, from which the cerebrospinal fluid was being reinfected. This is compatible with the presence of exudate over the superior aspect of the cerebrum, which is characteristic of the morbid anatomy of this disease. Steele and Gottlieb (1941) at autopsy on one of their cases found foci of superficial cerebral thrombosis underlying the exudate.

The tolerance to the drug was extremely good in my case, as is usual in childhood and infancy. There was no vomiting, blood changes were mild and there were no other toxic signs. All observers agree (Rhoads et al. 1940) that blood-transfusion is to be preferred to withdrawal of the drug if mild toxic blood signs occur.

because it is important to maintain a high dosage to combat the pneumococcus.

SUMMARY

A case of primary pneumococcal meningitis in a male infant aged 17 months was successfully treated with 74 g. of sulphapyridine.

In treating pneumococcal meningitis, particularly in infants, large doses of sulphapyridine are essential. A high initial dosage should be given, and the drug should be continued for at least a week after the temperature has subsided and the CSF become sterile. Any primary focus of infection should be sought and eradicated.

I wish to thank Dr. W. Allen Daley, medical officer of health of the London County Council, for permission to publish this paper; and Dr. B. Gottlieb for his advice. The pathological work was carried out in this hospital and the Group Laboratory at Archway Hospital (LCC).

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Reviews of Books

Value of Health to a City

Two Lectures delivered in 1873 by MAX VON PETTENKOFER. Translated and introduced by HENRY E. SIGERIST. Baltimore: Johns Hopkins Press. Pp. 52. $1.

Max von Pettenkofer (1818–1901), physiologist and biochemist, was appointed first professor of hygiene at the University of Munich in 1865, and promptly started research into public health. He was much impressed by what had been done in England, especially by the reduction of the death-rate of London to 22 when the rate was 33 in Munich. The two lectures he delivered in 1873, which Sigerist has translated admirably, were devoted to the contrast between London and Munich and the reasons why London had a much better health record. Though seventy years old these lectures are strikingly modern and have a topical value to those engaged in postwar planning; for what Pettenkofer promised for hygiene it has achieved in full. Pettenkofer's part in the development of modern hygiene is told in the introduction. Twenty years after Pettenkofer's appointment to Munich, Robert Koch became professor of hygiene at Berlin where he developed hygiene on a bacteriological basis and for a time dominated public health practice in European countries. British and American public health, started by the sanitation of Chadwick and Shattuck, has a much broader basis: Simon and Snow, among others, developed vital statistics which led to biometry and this, even today, is practised chiefly by English-speaking hygienists. Pettenkofer really belongs to the English school; he was an all-round man, and used everything he could find to advance public health; but he was a biochemist and his influence in the development of hygiene was largely in that direction. He was insistent on sanitation, in which he held that England was far ahead of all other countries, and even ahead of ourselves, for he said that our "homes were kept spotlessly clean," that "a justice of the peace will evacuate and condemn a dwelling-house as soon as it has been overcrowded beyond a certain measure, or has otherwise been found unfit for human habitation," and that "facilities for bathing are almost invariably found in English households." This was in 1873. A portrait of Pettenkofer as an old man looking not unlike Charles Darwin forms the frontispiece to the volume. Sigerist has done good service in giving us a new translation of the lectures and discarding the faulty earlier translation published in the *Sanitarian* in 1875.

Cardiac Symptoms in the Neuroses

DORIS M. BAKER, M.D. Lond., M.R.C.P., physician to the Elizabeth Garrett Anderson Hospital. London: H. K. Lewis. Pp. 49. 4*s*. 6*d*.

THIS is a modest statement about the frequency and character of left inframammary pain, sighing respiration and palpitation, in patients who came to a cardiac clinic but were without physical signs of cardiac disease. The writer does not go further than this, in spite of the larger promise of her title, and she does not attempt to consider the pathology of the symptoms in question. Her indifference to the special problems of neurotic illness is shown in her casual paragraph on treatment. The data put forward as to the frequency of these symptoms at a heart hospital are instructive, and indicate the need for further study such as has been carried out in soldiers diagnosed as having "effort syndrome."

Aids to Anæsthesia

VICTOR GOLDMAN, L.R.C.P., D.A., major R.A.M.C. London: Baillière, Tindall and Cox. Pp. 235. 5*s*.

THIS compact handbook is at once up to date and orthodox. It is too small to cover every detail of anæsthetic technique, and the principles laid down are sometimes too dogmatic, but it is a worthy addition to the "Aids" series. The chief types of apparatus in common use are illustrated. Most anæsthetists are familiar with Guedel's laryngoscope, in which the blade and handle are set at an acute angle to one another; apart from a minor modification in the shape and size of the handle, the instrument shown as Goldman's laryngoscope seems to be identical with that of Guedel. The other popular laryngoscope in common use—that of Magill—is also illustrated. There are good sections on anæsthetics for special operations, on analgesia and anæsthesia in midwifery, on dental anæsthesia, and on local and spinal anæsthesia.

Electrocardiography

LOUIS N. KATZ, M.D., director of cardiovascular research, Michael Reese Hospital, Chicago; assistant professor of physiology, University of Chicago. London: Henry Kimpton. Pp. 580. 45*s*.

THE first essential in a textbook of electrocardiography is that the tracings should be of high photographic quality; by this standard Dr. Katz's book, which contains one of the most comprehensive series of tracings yet published, is a complete success. In the past ten years or so the varied pictures which result from cardiac ischæmia, ventricular hypertrophy, cor pulmonale and bundle-branch block have enlarged the subject of cardiography: these are all well described, and attention is given to the changes due to coronary insufficiency. In classifying the types of coronary insufficiency some new but logical terms are used, which need cause no confusion. Nearly the whole of the second half of the book is a good account of the arrhythmias in which, of course, the novelty and topical interest of the earlier sections cannot be maintained. There is adequate discussion of chest leads and nearly all the tracings reproduced include two of these leads. Among many publications on cardiography this one is outstanding.

Gas Cleansing Stations

LESLIE STEWART, M.S.I.A., A.R.P.S., training officer, first-aid posts, Manchester. London: Jordan and Sons. Pp. 63. 2*s*.

THIS book is an excellent, highly compressed yet clear guide to the procedure for treating blister gas casualties. It supplements ARP handbooks 1 and 2, and gives detailed instructions which these handbooks do not cover. Workers in the casualty service should read this little volume, for even if they are not directly concerned with gas cleansing stations the information given here will be of great value. There are 6 first-class photographs and 5 building layout plans. The text is mostly tabulated, with summaries, examples of records and specimen labels.

Messrs. William Heinemann (Medical Books) have obtained the English rights of "Shock Treatment in Psychiatry," by Lucie Jessner and V. G. Ryan, which was reviewed in our columns on March 21 (p. 356). They will issue the book in this country in the last week of April and the price will be 17*s*. 6*d*.

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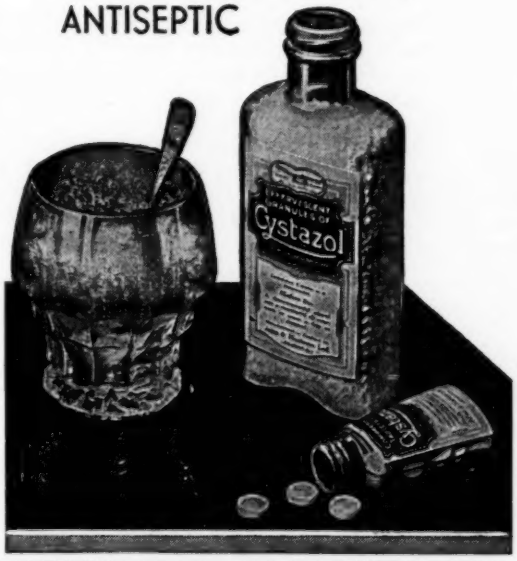

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THE LANCET

LONDON: SATURDAY, APRIL 11, 1942

INFAMOUS CONDUCT AND DUE INQUIRY

THE dilemma in which the General Medical Council found itself in the Spackman case was one of method rather than of principle. The GMC submitted its difficulty to the High Court and has received a reassuring reply. The circumstances were simple. In February, 1941, a seven-day hearing in the Divorce Court in the case of Pepper *v.* Pepper ended in a decree *nisi* on the husband's petition; his wife was found to have committed adultery with Dr. Spackman, the co-respondent. The decree was made absolute in August. In October the GMC sent Dr. Spackman the usual formal notice inviting his attendance at a meeting to decide the question of the removal of his name from the Medical Register. The notice referred to the decree and stated that it appeared that he had, at all material times, stood in professional relationship with the wife and that, in relation to the facts alleged, he was guilty of infamous conduct in a professional respect. For the proceedings before the GMC Dr. Spackman retained a solicitor, Mr. Oswald Hempson, who had not acted for him in the Divorce Court. Mr. Hempson told the GMC that he desired to call evidence which was not before the Divorce Court, with a view to going behind the decree. This evidence, he said, was available at the divorce proceedings and could with reasonable diligence have been called there; had he been advising the co-respondent, it would have been called. The GMC's legal assessor informed Mr. Hempson that it was the council's practice to accept, prima facie at least, the decree *nisi* as evidence of adultery, and that the onus was on Dr. Spackman to show some special grounds why the council should not accept it as such. After deliberating in camera, the council informed Mr. Hempson that it was not prepared to hear fresh evidence on the question of adultery. Mr. Hempson then addressed the council and called one witness. The council again deliberated in camera and then announced its decision to direct the Registrar to erase Dr. Spackman's name.

The legal problem, though difficult, was definite. Section 29 of the Medical Act specifies two grounds for the erasure of a name—conviction for crime and a decision by the GMC ("after due inquiry") that the practitioner has been guilty of infamous conduct in any professional respect. Had there been "due inquiry"? Mr. Justice Singleton in his minority judgment answers in the negative. The GMC, he maintains, cannot delegate its function of inquiring. He agrees that it is "obviously undesirable" that there should be a second hearing on the issue of adultery after the question has been fully investigated by a judge of the Divorce Division; this, he considers, may be a good reason for amending section 29; but, as the section stands, there must be due inquiry by the council, and in Dr. Spackman's case the first stage was the proof of adultery. The facts being disputed, the ordinary principles of the administration of justice require that the tribunal must hear the person against whom an accusation is made and any witness whom he desires to call. The Medical Act makes proof of a conviction conclusive; it has not done so in the case of a decree of divorce. The council does not hold due inquiry, says Mr. Justice Singleton, merely by ascertaining that somebody else has made due inquiry and has come to a decision in a suit between different parties. A finding by the Divorce Court that a man has committed adultery in one proceeding is not legally conclusive in another proceeding between different parties; the production of the decree is evidence of adultery but does not preclude the alleged adulterer from denying it. A man might conceivably have reason for allowing a divorce petition in which he was cited as co-respondent to go through without strenuous opposition, and yet might desire to contest the facts if attacked later in a professional capacity. It might be inconvenient for a non-legal body like the GMC to re-hear the issue of adultery; but this difficulty was to be remedied by the legislature and not by judicial decision. "Members of the medical profession desire to be, and ought to be, masters within their own household; but they are governed by the terms of the Act which gives them their powers."

So much for the minority judgment in the High Court. It states clearly the case for the practitioner whose whole professional career is at stake. For the layman the important element in the case will be that there was fresh evidence available which might have turned the scale in Dr. Spackman's favour. Logically, however, it would seem that the existence of fresh evidence is immaterial. If the minority judgment be right, a practitioner could dispute a divorce decree in every case before the GMC, even if he had no new witnesses to call. The majority judgments of the Lord Chief Justice and Mr. Justice Humphreys, on the other hand, establish that the GMC in accepting a divorce decree, does not abandon the principles of "natural justice." The council, says Lord Caldecote, is a domestic tribunal.

> "I cannot believe that Parliament intended to compel the council in all cases under section 29 to act as if it were a court of law trying a criminal charge. For one thing Parliament has clearly put no such duty upon the council in what perhaps are the more serious cases that come before it, namely convictions for felony or misdemeanour. For another thing the council has not been equipped for any such task; it is unable either to compel the attendance of witnesses or to administer the oath to such witnesses as can be called. So far as I can see, it is not bound by the rules of evidence. If then the council is not constituted as, or equipped with the powers of, a court, I think it is reasonable and right to suppose that Parliament meant to leave the council to devise its own means of ascertaining the facts on which its decisions must depend."

If the council were trying allegations for the first time, it would doubtless do its best to weigh the evidence in order to arrive at a just decision; it could not do so by shutting out evidence which in fairness ought to be heard.

> "A very different position is reached if the council finds that a more experienced and (as it thinks) a better fitted tribunal than itself has, after a full and fair hearing, found the accused person guilty of the conduct alleged. If the council takes pains to ascertain these facts, I do not know why that should not be held to be 'due inquiry.'"

The Lord Chief Justice observed that the ends of justice were more likely to be served by the practice followed by the council. It offends no one's sense of justice that Parliament has made a jury's verdict conclusive on a charge of crime. His own sense of

justice was not offended by the similar acceptance of the Divorce Court's finding. From the court's finding of adultery there was, as Mr. Justice Humphreys pointed out, no appeal. The latter judge, concurring with the Lord Chief Justice, gave his opinion that the High Court has no duty and no right to dictate to the GMC what witnesses it must hear, unless the refusal to hear them constituted a violation of the principles of natural justice. Those principles could not require the GMC to adopt a course which he believed would be "refused, in the circumstances, by any court of justice in the kingdom, appellate or otherwise."

It is not entirely satisfactory that a dispute of this kind should be decided by a majority of two judges to one, though the same position was visible in the famous case of Leeson, where the "natural justice" of the GMC was challenged in 1889 and where Lord Justice Fry disagreed with a majority which contained Lord Justice Bowen. The Spackman case does not greatly fortify the reformers who desire to see a right of appeal to the High Court from the GMC. Clearly the High Court would not have reopened the decision of the Divorce Court in the absence of any element of fraud or other overwhelming cause. If any change in the law be called for, it may be that the council should be given proper powers to summon witnesses and place them upon oath. The council's dilemma is probably due to the fact that the passing of the Medical Act in 1858 antedated by only a few months the operation of the Matrimonial Causes Act which created the modern scheme of divorce by judicial decree in England. Parliament at that time would hardly have foreseen such a problem as the Spackman case has propounded. Pending any amendment of the law, it is comforting to find that the judges find no fault with the procedure which the GMC has made it a practice to follow or with the essential fairness of the domestic tribunal of the profession.

MERCURIAL DIURETICS IN HEART FAILURE

THE clamour for diuretics dates back many centuries to the earliest association of dropsy with impairment of renal function, but until twenty years ago these drugs were chiefly remarkable for the mediocrity of their therapeutic achievements. The alkaline citrates and acetates, the volatile oils, sweet spirits of nitre and a few more have drifted down to us through centuries of dogmatic teaching and clinical credulity, scarcely able to hold their ground even in students' textbooks. On the other hand, the value of water as a diuretic has never been disputed; WITHERING'S classical observations on the action of foxglove in dropsy have received universal acknowledgment; the increased output of urine after taking alcohol and beverages containing caffeine cannot be accounted for in terms of fluid intake alone; and mercury in the form of grey powder or calomel is cardiac of inducing profuse diuresis in cases of capable œdema. Ever since its recommendation as a diuretic by PARACELSUS in the 16th century mercury has enjoyed a considerable reputation in the treatment of dropsy. STOKES in his "Diseases of the Heart and Aorta" (1854) wrote: "It happens again and again that the exhibition of mercury, will, as by enchantment, remove the anasarca." On the other hand, most clinicians today, while admitting their experience of dramatic results from inorganic mercury, would add that the action is unreliable and capricious. There is still no unanimity on the mechanism of this action, but the majority vote now favours a direct action on the kidney, reducing tubular reabsorption of water. On this view, as GOODMAN and GILMAN [1] put it, the action represents a very early stage of the toxic action of mercury on the kidney, though there is no suggestion that the mercurial diuretics cause any permanent kidney damage.

Four hundred years had to elapse before any substantial progress could be reported in the therapeutic application of mercury as a diuretic; and even then, as so often happens, the advance was attributable to accident rather than design. Working on organic mercurials for the treatment of syphilis, ZIEGLER [2] in 1917 employed the compound 'Novasurol,' but it was SAXL [3] three years later who called attention to the remarkable diuretic properties of this substance. The occasional poisonous effects of novasurol stimulated the search for non-toxic organic mercurials, and during the past quarter of a century therapeutics has been enriched by the addition of a number of preparations highly effective as diuretics but having a very low toxicity. In a comprehensive review of the organic mercurial diuretics five years ago THOMSON,[4] at the cardiac department of the London Hospital, found that after the intravenous injection of 2 c.cm. of mersalyl (*BP*), its proprietary equivalent 'Salyrgan' (Bayer), 'Neptal' (M&B) or 'Novurit' (Mdale), the average 24-hour output of urine was in the region of 3000 c.cm. The effectiveness of novurit suppositories was about 80% of that of organic mercury injected intravenously. The simultaneous administration of digitalis did not enhance the value of these diuretics, but there was almost invariably a greater output if ammonium chloride was given before the mercurial. THOMSON maintained that "the mercurial diuretics should take precedence even over digitalis where œdema is the prominent feature in congestive failure. Hydrothorax or ascites will respond to these preparations, which should make the use of paracentesis, skin puncture, or Southey's tubes a rare necessity. Where there is cardiac asthma, orthopnœa, and enlargement of the liver—yet without external œdema—they should be used; and for incipient heart-failure they find a place with digitalis in preventing the onset or recurrence of œdema."

EVANS and PAXON,[5] also working at the London Hospital, have pursued this research further and have compared the diuretic potency of 'Esidrone' (Ciba), mersalyl, neptal and salyrgan, when given intravenously or intramuscularly. (These preparations all contain various amounts of theophylline, intended, says the BP[6], to inhibit the decomposition of the mercurial complex, but presumably enhancing its action as well.) Esidrone apparently came out best in this test, followed by neptal, salyrgan and mersalyl, but it is doubtful whether enough patients were tested to justify conclusions on relative efficiency. Intravenous injection was considered decidedly more effective than intramuscular, and was preferred

1. Goodman, L. and Gilman, A. Pharmacological Basis of Therapeutics, New York, 1941, p. 604.
2. Ziegler, K. *Münch. med. Wschr.* 1917, **64**, 1257.
3. Saxl, P. *Wien. klin. Wschr.* 1920, **33**, 179.
4. Thomson, W. A. R. *Quart. J. Med.* 1937, **30**, 321.
5. Evans, W. and Paxon, T. *Brit. Heart J.* 1941, **3**, 112.
6. Addendum, 1936, p. 47.

by patients as being less painful. Rectal administration (novurit and salyrgan suppositories) was less effective and more unpleasant than tablets by mouth, and in more than a third of patients produced no diuretic response whatever. The most striking finding was the value of oral preparations, though here again there were some failures. Mersalyl, salyrgan and neptal tablets, each containing 0·08 g. of the mercurial salt plus 0·04 g. of theophylline, were compared, the patient being given gr. 30 of ammonium chloride, followed by 2, 4, 6 or 8 tablets as a single dose, or 2 tablets three times during the day. A dose of 4 or 6 tablets of neptal worked best, and a single dose, though more apt to produce vomiting, was less apt to produce diarrhœa than divided doses. EVANS and PAXON met with no serious complications. They agree that premedication with ammonium chloride is superior to other methods, and they favour a single dose of gr. 30 (four enteric-coated chocolate tablets containing gr. 7½ each) given two hours before the mercurial diuretic. They did not study the effect of giving large doses of ammonium chloride (gr. 30 three or even four times a day) over long periods, but it is reassuring to know that their simple technique of premedication is as effective as the previous methods which occupied two days, for there are obvious disadvantages in delaying the mercurial when cardiac failure is accompanied by gross dropsy. For patients confined to bed with œdema from cardiac failure EVANS and PAXON recommend the injection of a mercurial diuretic (2 c.cm.) every third day; during the ambulatory stage a mercurial may be given by mouth once or twice weekly according to the severity of the case. If this experience at the London Hospital is confirmed oral preparations should find an extensive following in private and outpatient practice, for one of the disadvantages of the mercurial diuretics has been the necessity of giving them by injection or by rectum.

THE SUPPLY OF DENTISTS

The numbers on the present register are hardly adequate for a post-war dental health service. The strength of the present register will drop rapidly in about ten years' time, as those registered under the 1921 act retire or die. Student entries are falling, and will continue to fall unless the profession attracts more entrants. As student entries affect the register five years ahead, the seriousness of the problem should be fully realised now.

A lean time is coming for the care of the nation's teeth. This, although long heralded, has never been so convincingly set out as in the memo [1] of which the concluding summary is reproduced above. It may not appear as critical as the situation met by the Dentists Act of 1921 when the roll of dentists suddenly jumped up from 5831 to 12,762 by the inclusion of all bona-fide practitioners, but it will be more difficult to meet, for in future there will be no convenient pool of undiplomated dentists to draw on. The late Sir FRANCIS ACLAND was tireless in his insistence on what he called a rule-of-three sum, which formed the burden of several of his addresses to the Dental Board. If, he was wont to inquire, 250 new licentiates a year were needed to maintain the pre-act register of 5000, how many licentiates (which means a larger number of entrants) would be required to maintain the post-act register of 14–15,000? The answer, he said, was 700—but the entry was not even half this figure. It now averages 317. And if it should be argued that surely a roll of 15,000 is more than enough, the refutation was simple in 1939 when dental graduates were being absorbed into practice as soon as they appeared and the competition for public appointments was meagre.

The acuteness of the coming famine needs a little explaining but Dr. WILKINSON makes it very clear. During the years 1922–23 more than 8000 persons came on the register and assuming their average age as above 30 then in 1951 they will be at least sexagenarian and the lustrum 1955–60 will witness their loss through retirement or death. This is certain, but since the Dentists Register has not been classified according to age-groups it is not possible to predict with certainty the exact number of new entrants required each year to maintain the register despite this coming exitus. He has however worked out with the help of Mr. H. W. SINGER, Ph.D., the probable age-distribution of dentists practising in this country at the present moment.

Aged 60–67 ..	1205	25–30 ..	1303
50–60 ..	3280	Under 25 ..	716
40–50 ..	5056		
35–40 ..	1869	Total	14,428
30–35 ..	999		

The table, which is based on the assumption that all new graduates are 23 years old and that dentists retire or cease to be effective at 67, implies the retirement of 172 persons a year in 1943–49, 328 a year in 1950–59, and 505 a year in 1960–69. To replace this wastage will require a student entry of 364 a year in the coming decade and of 560 in 1955. And Dr. WILKINSON reminds us that it is necessary to think five years ahead and that 10% of entrants fail to qualify.

As things are there is no prospect of the need being met and the memo ends with some highly practical suggestions. At present, on account of the high cost of the course, and because considerable capital is required to buy or establish a practice, dentistry has to recruit students from a somewhat limited class in possession of financial resources. The professions of medicine and law are also open to this class, and by reason of their higher social status and financial reward they outweigh the attractions of dentistry as a career. If, however, the cost of the dental course were reduced, and so made a possible choice for those who now take engineering, architectural or science courses, it would, in view of a good livelihood immediate on qualification attract more entries. Furthermore, if the Dental Board were to resume its bursary scheme and other scholarships were provided, some students now constrained to enter the teaching profession would have an opportunity of making dentistry their career. It really boils down to this. (1) Make dentistry more attractive by raising the social status of the profession and by levelling up the prospects in later life to those in medicine and law. (2) Open the choice wider by lowering dental school fees and providing scholarships. The first policy cannot be made effective soon enough to prevent a disastrous fall in the numbers on the register. The second policy could be effected immediately, without interfering with the first as the ultimate aim.

1. Memo on the decline in student entries to dental courses, prepared for the Dental Education Advisory Council by Prof. F. C. Wilkinson, M.D., M.SC., D.D.SC., and sent to the Ministry of Health and its Scottish counterpart.

Annotations

HOUSEWIVES ON FOOD

MASS-OBSERVATION have taken the opinion of housewives on the food situation this spring and compared it with opinions given on the same subject this time last year. They find that 77% of their sample think the position good on the whole, 13% consider it fair and 7% are dissatisfied; the answers of the remaining 3% could not be classified. The points system of rationing tinned foods and fruit has been welcome. Some of the foods lacking last spring have been plentiful this year—for example, in 1941, 59% of women mentioned the cheese shortage, whereas it was scarcely mentioned in 1942. In 1942 the commonest grumble is about the lack of cakes, but only 23% of women mentioned it—well under half the number who felt so strongly about cheese last year. There has been less grumbling, too, about marmalade, onions, tinned foods, dried fruit and syrups; the change here can be put down to more certain and equitable distribution and to the points system. Fresh vegetables and fruit have become scarcer since last year, and they hold a higher position on the grumbler list in consequence. Some resent the high price of fish and complain that in order to get any they have to turn up early at the fishmonger's. Salted cod does not yet seem to be a universal taste. Grumbles about eggs have fallen off in spite of the greater shortage. People realise that though eggs are few those available are fairly distributed; their chief complaints have been about bad eggs. Milk, on the other hand, they feel is unequally shared; some of those who live near the end of a milk round do unusually well because the milkman at that stage can use his discretion. On the whole, however, grumbles about specific foodstuffs have fallen off greatly since 1941, and queues seem to be less common than they were. The most regular queues are for confectionery and tobacco—which looks as though people are getting necessities in comfort, and are prepared to take a little extra trouble to get luxuries.

MINOR PSYCHIATRY IN GENERAL MEDICINE

A TASK of moment for constructive planners is to ensure more general and competent teaching of psychological medicine. The failure of medical recruitment boards to weed out a large number of the mentally unfit from among applicants, and the delay which is usual before such men are recognised and discharged from the Forces, as well as the shortage of trained psychiatrists, all show that psychiatry has not yet been given an adequate place in medical education. Improved teaching does not mean that the student should spend more hours in visiting mental hospitals to see the inmates demonstrated like freaks in a circus—the only psychiatric instruction still provided in many famous schools. What is sometimes called minor psychiatry—border-line cases, neurotics and those with psychopathic personalities—are of far greater interest to the future general practitioner. It is even more essential that he should realise how closely psychological factors are woven into the causative nexus of many ordinary conditions. This was brought out well in a lecture given last year by Franconi,[1] professor of pædiatrics at the University of Zurich—itself one of the nurseries of modern psychiatry and psychotherapy. That a teacher who is not a psychiatrist should try to bridge the gap between psychological and general medicine is itself significant; the indifference shown by teachers in other branches of medicine has seriously obstructed the student in appreciating the psychological factors in disease. Such factors, it is true, often spoil the scientific picture, and many teachers are content to leave them out for the sake of clearness when presenting the physical aspects of an illness. Franconi began his lecture by demonstrating a typical case of rheumatic arthritis with endocarditis in a child of 6, and comparing it with a case of acrodynia (vegetative neurosis) in a child of 7½. Joint pains were present in both, but the child with acrodynia showed in addition tremor, listlessness, hypotonia and the characteristic photophobia, rapid pulse-rate, flushed extremities and rash of pink disease. A third child, aged 3½, was shown, in whom tremor, night sweats, and disturbances of sleep might have suggested pink disease; but she was, in fact, an only child mismanaged by a nervous mother, and all her symptoms were referable to that misfortune. From these and similar cases Franconi developed a scheme showing how physical, functional, psychological and environmental factors overlap in the production of a disease picture. It is especially difficult to establish the psychological factors operating in children; Franconi's hints to students were based on common sense and clinical experience, but they were just the things which are often left unsaid because they seem so obvious. There is, of course, a danger that the student introduced to the elements of psychiatry will be tempted by those attractive solutions of almost any human problem which are offered by some psychotherapeutic schools. It calls for experience and critical judgment on the part of the teacher if psychiatry is to be given its appropriate place—no more, no less—in medicine. Franconi treats Freud's doctrine as a metaphorical pattern, and indicates the scope and the limitations of psycho-analytical interpretation when applied to biological events. Diagnosis must depend on both somatic and psychological investigation, as he illustrates from case-histories. Psychology, he believes, can be better taught on the single case than in theoretical lectures.

1. Franconi, G. *Schweiz. med. Wschr.* 1941, **71**, 1465, 1489.

FATIGUE

DEFINITIONS of fatigue are misleading because the subject's own opinion plays such a large part in the symptoms. The term is commonly used to denote a diminished capacity for doing effective work as a result of previous activity; but what actually causes the capacity to diminish? A man may feel tired because he considers he has done enough. The psychic component often overshadows the physiological component; and stimulants may act by removing the sensation of weariness without changing the physiological state. Hellebrandt and Karpovich[1] have surveyed the methods commonly used to improve physical performance in man, and find they can be roughly grouped as measures which delay exhaustion, hasten recuperation, or dull awareness of fatigue. Of those which delay exhaustion the most important seem to be nutritional, whereas (except for sugar and salt) drugs are the chief agents in the other two groups. Rest, oddly enough, is not mentioned as a cure for fatigue, though the psychical and physiological benefits of rest pauses in factories are well known. Hellebrandt and Karpovich, however, are concerned chiefly with troops exposed to strains in which no pausing is allowed. Evidence about the effects of diet on physical performance is conflicting. Various classes of heavy workers, such as lumbermen, eat a great deal of fat, though it has been shown that work pushed to the pitch of exhaustion can be sustained longer on carbohydrate. But after all, the balance of a diet containing even as much as 40% of fat must be made up of carbohydrate and protein (which is readily convertible to carbohydrate). Sugar is thought to produce immediate benefit in exhaustion by relieving the effects of incipient hypoglycæmia on the brain. The authors of the survey find no conclusive evidence that glucose is used by the body immediately, or has any prompt effect in states short of hypoglycæmia; and hypoglycæmia they consider is only induced after long and exhausting exercise. It is possible, however, that hypoglycæmia is not so difficult to achieve as they suggest.

1. Hellebrandt, F. A. and Karpovich, P. V. *War Med.* 1941, **1**, 745.

and that individuals may vary in this respect. Meat extracts have had a great reputation in the past as restoratives; Parkes, the military hygienist, believed particularly in them. They certainly stimulate the gastric mucosa, and so may promote digestion in a man who feels too tired to eat. Emergency rations, usually in the form of chocolate, or compressed meat mixed with fat, act as handy fuel. On the whole, however, diet seems to have no specific influence on performance except of course that it must be adequate if fitness is to be maintained. Agents reputed to increase performance by a direct action on muscle itself or on muscle metabolism are gelatin, glycine, vitamins, alkalis and phosphates, but evidence of their value is equivocal. Two years ago Morell [2] in Berlin demonstrated to his own satisfaction that energy output, as measured on a fixed bicycle, could be increased by giving tablets containing dextrose, vitamins C and B_1, and compounds of nicotinamide, and he recommended their administration to airmen and others called on to make long-sustained efforts; but his experiments were uncontrolled. It is agreed that additional sodium chloride benefits those who have to work in great heat. Drugs have achieved some success in the psychic field: thus alcohol, caffeine and amphetamine ('Benzedrine') all have their place, but regular doping with any of these drugs is not to be recommended. Alcohol should be classed as an emergency remedy, improving staying power and removing awareness of fatigue even if it does not increase muscular work. At one time oarsmen always took sherry just before a race; a small dose of alcohol taken immediately before exercise in this way has been shown to produce a temporary increase in work, followed later by a drop in performance lasting several hours. A larger quantity taken about half an hour before the test caused a diminished output of work from the start of activity. Caffeine, besides delaying the onset of fatigue and increasing work output, has a considerable psychic effect; the cup of strong sweet tea given to the tired soldier is no mean restorative. Benzedrine produces euphoria, wakefulness and mental stimulation. Natives in Bolivia and Peru chew coca leaves to ward off hunger (a local effect on the gastric mucosa) and to increase endurance (an effect of central stimulation); presumably some of them become addicts. Leptazol acts on the vasomotor and respiratory centres, producing a transient increase in power and delaying the onset of fatigue. Where a group of men are to be hardened, the best physical and mental performance is likely to be achieved if causes of constant pain or discomfort are removed (many will testify to the fatigue produced by persistent indigestion, for example), if general physical fitness is improved by regular training, and if they are given the chance to endure periods of hardship. If men are used to roughing it, it does not occur to them to find it tiring.

CLEAVAGE LINES

THAT some incisions leave almost invisible scars while others become broadened and even develop keloid is an old observation; the most important factor influencing the result is the relation of the incision to the tension or cleavage lines of the skin.[3] Dupuytren, in 1834, first pointed out that a wound made with a circular instrument does not remain circular, but becomes almost linear (a point of medicolegal importance). Other workers (notably Langer in 1861) studied the disposition of lines in the skin, and Kocher, in 1892, stressed their surgical significance. Cox [4] has lately elaborated the observations of Dupuytren, and working on the cadaver has made a complete series of such punctures, thus charting the whole body. In the main the charts resemble those of Langer, with notable exceptions on the back of the thigh, front and back of the arm, sole of the foot, and in the groin. Langer classified his according to age, but Cox finds a closer relation to body build, with variations in the upper extremity in people of similar build. The line pattern remains unaltered in excised skin, and is therefore intrinsic in the skin. Microscopical sections show that the essential factor is the disposition of the elastic and connective tissue fibres, running parallel to the cleavage lines, in the subcutaneous tissue. Skin retraction is minimal in incisions following the lines, and scar formation is consequently less. A study of these charts shows at once why longitudinal incisions behind the knee or in front of the wrist are better avoided, and that the common oblique inguinal or appendicectomy incisions should be placed more transversely. Where an incision must cross the natural skin creases Levitt and Gillies (see p. 440) advise prophylactic radiotherapy. Cleavage lines usually follow crease lines, the flexor aspect of the elbow being a notable exception.

VITAMINS IN OPHTHALMOLOGY

THE differentiation and synthetic preparation of the multitude of vitamin-B components have been accompanied by regular relays of progress in clinical research, and the eye has not escaped. Métivier,[1] working in Trinidad, holds that some forms of failure of vision in tropical countries constitute a clinical picture which he designates as tropical nutritional amblyopia. It corresponds closely to the toxic amblyopias seen elsewhere and appears to be due to deficiency of vitamin B_2. In some of his cases there was an associated epithelial dystrophy of the cornea, which does not seem to correspond with conditions in Europe known under that name, and Métivier holds that this is a characteristic lesion in B_2 deficiency. Vitamin B_2 looms rather large in recent discussions on amblyopia. Johnson [2] among others found it effective in rosacea keratitis, while in tobacco amblyopia he and other observers, such as Gottlieb,[3] have incriminated lack of vitamin B_1. Lately attention has been drawn [1] to conjunctival bleeding as a manifestation of hæmorrhagic disease of the newborn, arising from deficiency of vitamin K. But there is still much confusion over the significance of vitamins in eye disease. Even in such a relatively well-established entity as Bitot's spots there appears to be uncertainty whether all cases represent vitamin-A deficiency.

RUNNERS EXAMINE THE COURSE

THE Scottish National Union of Students has drawn up a report on medical education for the BMA Planning Commission, representing the opinion of the four university medical schools—Aberdeen, Edinburgh, Glasgow and St. Andrews. When anybody sits down to consider his own situation he can generally put an accurate finger on the defects but is also, perhaps, inclined to undervalue the assets; looking back on a past situation we gain perspective but also lose appreciation of detail, so that student opinion contributes something to the study of medical education which cannot be derived from any other source. The Scottish students have had two points clearly in their minds: that the medical course should form an integral whole, each subject being properly orientated in relation to the rest; and that the primary aim should be to turn out competent general practitioners. Their proposals for reform of the premedical course are much the same as those advocated last year at the meeting of the NUS at Cambridge [4]: they would like the formal courses in zoology and botany to be replaced by a more general course in biology, laying emphasis on the principles of evolution, heredity and development rather than on details of structure in examples of selected phyla. They feel that all necessary inorganic chemistry and physics could be learned at school, and that at the university

2. Morell, T. *Dtsch. med. Wschr.* 1940, **66**, 398.
3. See *Lancet*, 1941, i, 422. 4. Cox, H. T. *Brit. J. Surg.* 1941, **29**, 234.

1. Métivier, V. M. *Amer. J. Ophthal.* 1941, **24**, 1029 and 1265. 2. Johnson, L. V. *Ibid*, 1941, **41**, 1233. 3. Gottlieb, B. *Brit. J. Ophthal.* 1941, **25**, 556. 4. See *Lancet*, 1941, i, 489.

the student should study only organic chemistry and applied physics taught with regard to their bearing on electrotherapeutics, radiology and optics. In the same way they would like to see anatomy and physiology taught as interdependent subjects. In order that the student may realise that he is studying the normal standard, against which he must later measure abnormal findings, the report advocates occasional clinical demonstrations during this part of the course. This plan has already been tried successfully at Glasgow, the cases demonstrated being such as could be diagnosed by a knowledge of structure and function alone. It is also suggested that radiograms should be used freely in the study of anatomy, so that the student will become familiar with normal radiological appearances, that embryology and surface anatomy should be adequately taught, and that the study of normal function should include normal psychology—all sound constructive proposals. In the clinical years the students would like to see the teaching of pathology and materia medica linked up with the course in systematic medicine. They ask, too, that they should have the opportunity to follow up the post-mortem findings in fatal cases which they have seen in the wards—an opportunity which is already provided in some English schools. A plea for smaller numbers of students at clinics, for more lecture demonstrations, and for the chance to carry out common nursing measures and minor medical and surgical procedures is timely; so are the proposals that a prospective doctor should have undergraduate experience of general practice and that his training in midwifery should include the conduct of abnormal as well as normal cases: common sense demands that he should have such experience as a minimum before he is licensed to deal single-handed with an obstetric emergency. Less comprehensible is the suggestion that the teaching in public health should be reduced while that in the sociological relations of medicine should be extended: it is a reflection on the current teaching of public health that a well-informed body of students do not recognise these as being two names for the same thing. The Scottish students also wish for more clinical tutors whose main function shall be teaching—a wish rarely, it seems, expressed in the London schools. It is doubtful whether, in the long run, the man whose main function is teaching remains as stirring a teacher as the man who, racing to keep at the growing point of his subject, shies a golden apple at his students and hurries on. But much depends on the conscientious fulfilment of the obligation to teach.

CAT-BITES AND HUMAN BITES

BITES from domestic animals seem often to go septic and are slow to heal. Nothing much is known about the bacteriology of these infections of which Allin [1] has lately described three cases. Rimpau [2] in 1937 reported three cases in which local abscess-formation with or without adenitis followed bites by healthy cats; from two of these wounds and from the respiratory tract of both healthy and diseased cats Kremsreiter [3] isolated hæmoglobinophilic bacteria. However H. Schenk (quoted by Allin), in a study of pasteurella, found this organism in the air-passages of 15 out of 20 cats and recovered a similar organism in the pus from 4 cases of cat-bite infection. His organism was not only morphologically and culturally identical with *Pasteurella septica* but also produced the typical septicæmia in rabbits and mice. Allin's first case developed a local abscess on the volar aspect of the wrist a few days after the cat-bite; the wound was excised and healed without incident. But 11 months later pain and swelling developed on the dorsal surface of the wrist, and a subperiosteal abscess with osteomyelitis of the lower end of the radius was discovered. The necrotic tissue was removed, the cavity was packed with bipp and the wound healed uneventfully. In the second case, the hand of the victim was swollen and painful when seen 7 hours after the cat-bite but the infection subsided with local treatment. A third case became acutely ill with enlarged axillary glands after a bite on the finger, and three months later the axillary glands suppurated. From the first two cases a pasteurella was isolated which was rapidly lethal to rabbits, mice and guineapigs. No bacteriology was done on the third case and unfortunately the sera of the other two cases were not examined for specific antibodies. Pasteurellosis of the septicæmic type, and also the more chronic pseudotuberculosis, is not uncommon among animals; it is now coming to be regarded as primarily a respiratory infection, and the organism has been found in the mouth and nasopharynx of a number of animals including cats, rabbits and swine. It has hitherto been doubtful whether infection with pasteurella, apart from plague, can occur in man, but these observations of Allin and others should stimulate a more careful bacteriological study of infected animal-bites.

When man bites man the patient rarely seeks medical advice, and if he does is apt to conceal the true story. It is not generally realised how dangerous such bites can be, nor that a wound over a knuckle in a bare-fist fight or drunken brawl should be classed and treated as a human bite. Sucking hangnails also carries danger. Miller and Winfield [4] have drawn attention to the important work of Mason and Koch [5] from Kanavel's school, and have reported 61 cases of their own. They point out that such wounds readily become infected, and the infection tends to extend and invade deeper structures and to become foul smelling, necrotic and resistant to treatment. Vincent's organisms, streptococci and staphylococci, the colon bacillus, various fungi, and even *Spirochæta pallida* may be found. The wounds are usually situated on the dorsum of the hands, and often over the metacarpophalangeal joints, where a thin tendon alone intervenes between the skin and the joint itself. The act of opening and closing the fist immediately tends to spread any infection. Primary suture must never be performed, and excision and suture or cauterisation are not satisfactory. The correct treatment is to wash the part generally with soap and water for 5 minutes, then irrigate the wound gently with saline for 10 minutes. No probing is done but the edges are gently retracted to determine the extent of the damage, and after very limited debridement wet dressings are applied with the hand in the position of function. No sutures are used in the skin or damaged deeper structures. Many cases first appear when infection is well established. The treatment then follows the usual lines, but it must be appreciated that one is faced with a very dangerous type of infection, that extensive suppuration and tissue loss may occur, and that slow healing and recrudescences of infection are to be expected. There must be no hesitation in opening up the metacarpophalangeal joint by transverse incision if this is involved.

1. Allin, A. E. *Canad. med. Ass. J.* 1942, **46**, 48.
2. Rimpau, W. *Münch. med. Wschr.* 1937, **11**, 413.
3. Kremsreiter, *Arch. Hyg., Berl.* 1937, **118**, 2.
4. Miller, H. and Winfield, J. M. *Surg. Gyn. Obstet.* 1930, **74**, 153.
5. Mason, M. L. and Koch, S. L. *Ibid.* 1930, **51**, 591.

THE ANTI-DIPHTHERIA CAMPAIGN.—At a recent press conference in Edinburgh were presented the results of the campaign launched some 15 month ago to promote immunisation against diphtheria in Scotland. About 53% of pre-school children between the ages of 1 and 4 and 70% of schoci-children have been immunised, being some 65% of the population between the ages of 1 and 14. In a consecutive series it was found that 6886 cases of diphtheria occurred in non-immunised children and 959 in immunised children. The fatality among non-immunised children was 5·9%, among immunised children less than 1%. Local authorities varied in the success they achieved but the combined results demonstrate the energy with which the campaign has been pursued. The proportion of children in the community already immunised should be sufficient to reduce the incidence of diphtheria in Scotland.

Special Articles

HOME-LIFE OF THE BED-BUG

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TODAY, when we have witnessed some of the terrors of civilisation at war, we are inclined to forget its comforts and advantages. One benefit is the comparative freedom from parasites of civilised man. Attacks of body lice and fleas, the normal lot of more primitive societies, have become rare in civilised temperate countries. Some forms of vermin, however, such as the bed-bug, the head-louse and the itch-mite, are still disturbingly prevalent. Recent applied biological researches have given us improved methods of dealing with these species which will drastically reduce them if seriously applied.

This type of research draws constantly, if sometimes unconsciously, on physiological and ecological data, but in spite of the great number of papers on the bug, our knowledge of those aspects a few years ago was very deficient. This was pointed out in 1934 by the committee on the eradication of bed-bugs set up by the Ministry of Health. At that time Dr. C. G. Johnson undertook a study of these problems and has now published a complete account of five years' work.[1] Most of the recent papers on the ecology of the bed-bug have been German (Hase, Kemper, Titschack, Janisch and Geisthardt) and it is gratifying to see them surpassed by the work of English biologists (Johnson and Mellanby).

Johnson's aim was to find out how the environmental conditions of a bedroom in Britain can affect bed-bug infestations if no special measures are taken against them. Thus stated the problem sounds simple, but Johnson's report will remove that impression. It runs into 116 pages with 59 tables and 39 figures, and he calls it a "brief and very incomplete survey of the operation of some of the main factors in the biology of bed-bug populations." It is evident that the ecology of a free-living bug infestation is obscure and complex and its operation must be inferred by piecing together results of laboratory studies and observations of wild populations.

LABORATORY STUDIES

The earliest, uncritical, observations of natural infestations gave such conflicting results that this method was discredited and the field was almost entirely abandoned for the laboratory. This went so far that one got the impression that cimex was an insect normally occurring in glass vials in an incubator, and only rarely found on a bedroom wall. Biologists had lost sight of natural conditions and (for reasons of technical convenience) worked at unnaturally high temperatures. Johnson, however, obtained temperature records of unheated and heated bedrooms throughout the year in London and planned his laboratory experiments accordingly.

Even the best planned laboratory experiments are unavoidably artificial. Following the usual scientific plan of varying one condition at a time and observing the results, their aim is to show the relative importance of various environmental conditions on speed of development and on reproduction. With these data we can estimate the *potentialities* of bug populations, neglecting the vagaries of bug behaviour in a natural infestation, not to mention such cataclysms as spring cleaning or fumigation.

By far the most important factor in bug ecology is temperature. Lacking the constant regulated metabolism of vertebrates the whole tempo of bug life is set by the weather. The egg stage is scarcely dependent on anything else; over a considerable range the speed of incubation is directly proportional to the temperature. At the upper ($>32°$ C.) and lower ($<13°$ C.) parts of the curve, where the relationship fails, a greatly increased mortality is an indication of unfavourable conditions. In the blood-sucking stages, food-supply is of course essential; but assuming a host to be usually accessible at night the frequency of feeding itself depends on the temperature.

1. *J. Hyg. Camb.* 1942 **61**, 345.

During its development the bug must take one full meal of blood in each nymphal stage before it can moult to the next. The time spent in digesting (from meal to moult) at different temperatures can be easily found by laboratory studies. Another period that can be measured is the interval between the first feed as an adult and the commencement of egg laying. The time between the moult and the next meal is less certain; it depends on how soon the bug decides to go in search of food. All that can be done is to find out how soon after moulting a bug will feed if placed on the host, and make an estimate from this.

We are now in a position to estimate the mean periods at different temperatures from oviposition in one generation to oviposition in the next. These are made up as in table I (from table 8 in Johnson's paper).

TABLE I—RATE OF DEVELOPMENT ACCORDING TO TEMPERATURE

°C.	°F.	Duration of egg stage (days)	Sum of periods feed-moult for 5 nymphal instars * (days)	Period feed-first egg in adult (days)	Sum of estimated periods moult-feed (days)	Total (days)
28	82·4	5·5	14	2·7	12	34·2
25	77	7·1	24	2·9	12	46
23	73·4	9·2	29	5·4	18	61·6
18	64·4	20·2	66	9–12	30	125·2
15	59	34	119	23·7	60	236·7

* An instar is a stage in the life-history of an insect between two successive castings of the cuticle.

Within a certain range (say 16–30° C.) temperature merely affects the speed of the bugs' development. Outside this range it causes considerable mortality. Janisch found that continuously high temperatures slightly above the optimum range caused mortality and finally sterility in a culture. Johnson shows that at temperatures of 15° C. (59° F.) and below there is a high egg mortality and also a great reduction in the number of nymphs which can moult successfully. This is of great practical importance, for the temperature in an unheated bedroom falls below 15° C. for several months in winter and the result is a hibernation period with complete cessation of growth and breeding.

Apart from temperature, the other vitally important matter to the bed-bug is food-supply. Perhaps its greatest effect is on the egg production of the adult. This is most obvious if the bugs only obtain incomplete meals—that is, if they are disturbed while feeding. The meals of bugs that feed to repletion are correlated with the weight of the bugs and the egg production is also related to this. Apart from the size of each meal, the frequency of feeding naturally affects egg production. At 23° C., if the bugs are fed at 10–15 day intervals, there is a latent period and then a batch of about 8 eggs laid over 2–3 days. With more frequent feeding the latent period is reduced, and finally, with two feeds a week, egg laying is almost continuous. The frequency of feeding in nature is uncertain. According to indirect evidence, Mellanby estimated that it must occur about once a week in a warm infested animal-house.

TABLE II—EFFECT OF TEMPERATURE AND HUMIDITY ON SURVIVAL DURING STARVATION

°C.	% RH	Length of life (days) of adult bugs fed once on rabbit			
		(Male (mated)		Female (mated)	
		Mean	Maximum	Mean	Maximum
7	10	208	291	228	306
	90	219	382	286	461
13	10	187	256	179	235
	90	338	464	360	562
18	10	97	148	91	139
	90	151	257	143	222
23	10	40	57	38	67
	90	85	135 (unmated)	69	126 (unmated)
7	90	223	518	317	550
23	90	87	126	121	181

Humidity plays a minor rôle in bug ecology. Its effects on development and reproduction are smallest when other factors (food and temperature) are optimum. Under adverse temperature conditions (cold or heat)

there is less egg mortality at a high humidity (about 90% RH) than at a low one (7% RH). The influence of humidity is most pronounced during starvation, when the high humidity again is much more favourable. Survival during starvation is also greatly influenced by temperature, and the two combine as in table II (from Johnson's table 41).

These figures are for bugs resting quietly in tubes in the dark. In a natural infestation they wander about even at surprisingly low temperatures (9° C.) and this movement uses up the food reserves. Consequently the laboratory data are seldom attained by wild bugs.

OBSERVATIONS IN THE FIELD

Turning from laboratory studies to naturalistic experiments we find some interesting results from artificial infestation of small sheds with and without animal host present. Periodical examinations of the populations revealed the appearance of the different stages at about the times to be expected from the temperature records. That is to say, the development rate in the field agrees with laboratory indications. On the other hand there was a surprisingly high mortality among the released bugs whether a host was present or not. This was undoubtedly due to their very considerable activity exhausting their food reserves. Observations on the numbers of bugs caught in traps or changing position from day to day provided information about this wandering. The amount of movement was usually well correlated with mean daily temperature and was greater if a host was present than if the host were absent. Records made by Mellanby at different intervals throughout the 24 hours showed a well-defined peak at dawn.

Naturalistic experiments, however, cannot give a final answer to the natural ecology of bug infestations in bedrooms. Johnson has made some detailed calculations of probable population growth in two London bedrooms based on their temperature records. These are entirely theoretical but they are interesting because they show how greatly the bed-bug is favoured by warming its habitat slightly during the winter. In an unheated room the temperature drops below the hatching and development threshold (about 13° C.) for several months. During this period, growth and development stops and moreover the insects seem to be deterred from feeding by low temperatures at which they still wander about. Consequently there is a considerable mortality during the winter, especially of the more susceptible younger instars.

According to Johnson's calculations a spring population of 40 adults in an unheated house might produce 950 sucking insects by the autumn. Then during the winter reproduction and growth would cease and mortality would reduce this population to some 60 adults and a few nymphs. On the other hand, bugs in a warmer room (e.g., a bed-sittingroom, heated in winter) go on feeding and breeding throughout the winter and the 40 bugs produce 3000 active progeny from March to February. At this time, there would be a large proportion of younger instars. Johnson gives details from some samples from London, Glasgow and from Ireland. It is interesting to find that the samples from heated bed-sittingrooms show a greater proportion of fertilised females early in the year and at the same time a greater proportion of young instars.

FUTURE RESEARCH

Johnson merely claims to have made a "start on what may be a promising investigation." Other subjects that require further investigation are listed at the end of his paper. Most of the data required must be sought in the field. Johnson has had to repeat a lot of laboratory tests because they had previously been done at abnormal temperatures but now the laboratory picture is practically complete.

A weakness in some of Johnson's naturalistic experiments is that animal hosts were used. It is true that physiologically the nutrient values of the different bloods is not so different. But the ease with which bugs can approach and suck blood depends on the habits and anatomy of the host. Moreover, many hosts eat large numbers of bugs and thus vitiate the results. Further work should as far as possible include observations of natural infestations in dwelling-houses.

As to the problems that require solution; we have only vague ideas on the population density which constitutes a real nuisance, of the proportions of a population which emerges per night, and of the proportion that successfully feeds. The question of how the bug finds its host is still unsolved and also we do not know how it returns to a hiding-place nor if it is usually the same one. The average and maximum distances a bug will travel to a host and subsequently return are also unknown. Above all there is the question of infestation of new premises and especially now of air-raid shelters. New work on these questions will be made easier by Johnson's excellent monograph.

PRIMARY TUBERCULOSIS IN ADULTS

THE Epidemiological section of the Royal Society of Medicine discussed primary tuberculosis in adolescents and adults at its meeting on March 27. In the opening papers, Dr. GREGORY KAYNE dealt with the historical, clinical and epidemiological aspects, and Dr. WALTER PAGEL provided a graphic morbid anatomical demonstration. Both speakers emphasised the importance of defining primary tuberculosis on a strictly pathological basis, as the first lesions produced when tubercle bacilli are first introduced into the body, whether by lung or intestine. Since these lesions may be so small or so situated that they do not show up in a radiogram, confusion will arise if, as has recently been done by some American writers, the first radiological manifestations are regarded as identical with the lesions of primary tuberculosis. Both Dr. Kayne (on the basis of clinical observations) and Dr. Pagel (on the basis of detailed post-mortem investigations) affirmed that in adolescents and adults, as in children, the first introduction of tubercle bacilli results in the formation of a primary complex. Unlike in children, however, in whom the hilar glands are always more extensively involved than the lung, in adults the hilar involvement may be greater or smaller in degree. Dr. Pagel found no structural differences in the hilar glands of non-tuberculous adults which would account for this. The subsequent course of primary tuberculosis is similar in children and adults in that both fatal and chronic dissemination may occur, but both speakers brought out one important difference. In the adult, but not in the child, primary infection may often be followed in a short time by bronchogenic tuberculosis (the common form of pulmonary tuberculosis that spreads by the bronchial system). Thus an adult with the typical clinical picture of bronchogenic tuberculosis may have been primarily infected within the previous two years or less. Dr. Kayne referred to the widely held belief, based on Naegeli's post-mortem findings and Pirquet's tuberculin surveys, that nearly everyone has been infected by the time adolescence is reached. This belief was exploded in 1927 when Heimbeck reported that a large proportion of student nurses in Oslo were in fact tuberculin negative. Many similar tuberculin and radiological studies, carried out over a period of years, have since appeared from Scandinavian countries, the United States, France, South America and elsewhere. Fresh morbid anatomical material has also been provided. Surveying these, Dr. Kayne concluded that while in towns as many as 80% of adolescents have already been infected, in most districts this percentage is no higher than 50 and even much lower, and that from then on primary infection in the general population takes place more or less gradually, with a maximum rate between 15 and 25 years; but among groups in contact with the disease—for instance, nurses and medical students—the rate is much more rapid.

In most adolescents and adults the primary infection is associated with no symptoms or signs and no radiological changes, but in some, with the change in tuberculin reaction, symptoms do occur. These may be erythema nodosum, fatigue and malaise, cough, pain in the side and gastrointestinal disturbance. Either with or without such symptoms radiological changes may be found, consisting of a typical primary complex or of hilar enlargement alone. Among both this group and the larger one without signs or symptoms pleural effusion commonly develops some months after the change in tuberculin reaction. But this interval is longer when the effusion arises ab initio, suggesting that in these

cases the effusion has followed a clinically insignificant primary complex and is not the first lesion of primary tuberculosis. Similarly, foci of bronchogenic tuberculosis may develop among both groups, but the interval after the change in tuberculin reaction is again longer in the group among whom the bronchogenic tuberculosis is apparently the first clinical manifestation. Dr. Kayne pointed out that few relevant observations have been published in England, but the low incidence of infection at adolescence in so many countries, and the falling incidence of infection, justifies speculation. Since primary tuberculosis at any age tends to weed out the most susceptible individuals, among whom it proves fatal, a falling incidence of infection in childhood must result in an increasing proportion of susceptible people being infected in adolescence and adult life with a corresponding rise in fatal disseminated forms at those age-periods. Dr. Kayne showed how this phenomenon may at least in part account for three epidemiological observations—the generally low mortality from tuberculosis in later childhood; the retardation in fall of tuberculosis mortality among young women since 1900; and the large increase in tuberculous meningitis since the beginning of this war in the young adult group. He maintained that in planning the control of tuberculosis discussions on the relative importance of endogenous or exogenous reinfection are largely academic. When there are many uninfected adolescents, and when bronchogenic tuberculosis may follow soon after the primary infection, exogenous infection as a cause of bronchogenic tuberculosis plays an essential rôle in one way or the other. Thus both contact and lowered resistance are of decisive importance in prevention.

In the subsequent discussion, Prof. LYLE CUMMINS and Dr. V. S. HODSON referred to the malignant form taken by primary tuberculosis in primitive races; but even in connexion with them environmental conditions play an important part in the course of the disease. Dr. F. A. H. SIMMONDS referred to personal experiences in regard to incidence of infection and primary tuberculosis among nurses. Mr. R. N. J. INNES related observations on primary tuberculosis in animals. Surgeon Rear-Admiral SHELDON DUDLEY commented on the fact that in spite of the energetic measures taken to detect and treat tuberculosis in the Navy the incidence of the disease has not fallen; primary tuberculosis may be responsible for this. Two other points emerged from the discussion—the crying need for field investigations involving tuberculin surveys in this country, and the importance in the control of tuberculosis of keeping up the resistance of all adolescents and young adults by attending to their living and working conditions.

INFECTIOUS DISEASE IN ENGLAND AND WALES

WEEK ENDED MARCH 21

Notifications.—The following cases of infectious disease were notified during the week: smallpox, 0; scarlet fever, 1296; whooping-cough, 1553; diphtheria, 900; paratyphoid, 13; typhoid, 7; measles (excluding rubella), 2080; pneumonia (primary or influenzal), 1567; puerperal pyrexia, 175; cerebrospinal fever, 281; poliomyelitis, 4; polio-encephalitis, 2; encephalitis lethargica, 3; dysentery, 146; ophthalmia neonatorum, 94. No case of cholera, plague or typhus fever was notified during the week.

The number of civilian and service sick in the Infectious Hospitals of the London County Council on March 18 was 1462, including scarlet fever, 136; diphtheria, 219; measles, 93; whooping-cough, 478; enteritis, 77; chicken-pox, 52; erysipelas, 38; mumps, 73; poliomyelitis, 1; dysentery, 25; cerebrospinal fever, 33; puerperal sepsis, 25; enteric fevers, 8; german measles, 4; encephalitis lethargica, 1; other diseases (non-infectious), 124; not yet diagnosed, 85.

Deaths.—In 126 great towns there was 1 (0) death from an enteric fever, 2 (0) from scarlet fever, 5 (1) from measles, 7 (4) from whooping-cough, 15 (0) from diphtheria, 38 (6) from diarrhœa and enteritis under 2 years, and 66 (9) from influenza. The figures in parentheses are those for London itself.

Birmingham reported 1 death from an enteric fever.

The number of stillbirths notified during the week was 239 (corresponding to a rate of 35 per thousand total births), including 28 in London.

In England Now

A Running Commentary by Peripatetic Correspondents

MOST MOs of destroyers on appointment have visions of long hours of leisure enabling them to study and to read all that has been unread. This high ideal remains a high ideal—the ocean swell takes away both the desire and the performance. Yet time does not pass slowly. In rough weather a profound lethargy whiles away the hours. In gales the philosopher may ponder over the teleological importance of his vomiting, and he may wonder if a physician who prays for a merciful release for himself in death is at his best to elicit the physical signs of early pneumonic consolidation from a patient, at one minute swung eight feet away, at the next flooring his examiner. (Any hints, by the way, on the use of the bedpan in these circumstances acceptable.) In fine weather the philosopher can reappear and like Aristotle observe both men and beasts. There are a few minutes to be spent in the not-so-sick parade, then a whole day for thoughts and birds and beasts. In Darwin's view fulmar petrels are the most numerous of birds, and certainly to an erstwhile landlubber it is a revelation to find such quantities of birds at sea. Our observer identifies each species—shearwater, kittiwake or auk—and loyally counts each fulmar for the British Ornithological Society. (His offers to navigate and find the ship's position by the birds around are treated with merited ridicule.) It is a source of pride to know how many oceanic species have been described and called after ships' surgeons. There are the migrants to be helped on their way. One busy day, the first lieutenant lay sick from catarrhal jaundice, a redshank from exposure and a starling from the mental shock of finding itself five hundred miles from land. Forced feeding of gin and lime killed the starling; despite warmth and rectal salines the redshank was just unable to fly the hundred yards to the shore; but, too comatose at one time to object to the redshank perching on his nose, the first lieutenant still survives. When darkness falls, there is the first-aid class to be instructed. A dead eider duck found floating nearby, dissected with the aid of Macgillivray's British Birds, provided knowledge to both teacher and taught. Its stomach, with the mussel shells contained therein, fill our "gastrics" with longing. Finally the brief day of philosophic pose and omniscience comes to an end. The sea-lawyer of the crew as innocently as ever asks if all animals drink fresh water. On being firmly answered "yes" the discussion is turned to the cetacea.

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Having been brought up as a naturalist, I am not deceived when my chief stops at the end of a bed and in dulcet voice says to the patient: "Now tell me all about the start of your trouble. . . . Ah, yes. . . . Just so. . . . Ah, yes"; for I note his eagle eye is fixed on the front page of the *Daily* ——, which he is not privileged to read at home, especially, I guess, on "Burglar Bites Inspector" and "Imminent Naval Battle," neither of which is mentioned in the *Times*. Yet there is no insincerity about it; the fact is, man's receiving apparatus (having been so much longer in use?) is ten times quicker than his transmitting, and his mind, like a dog on a walk, scours the country while Old Words, who thinks he's master, plods along behind.

In OPs a nurse is getting the things ready for me to take off an old-fashioned plaster from a child's leg—a sultry job. On her arm are a number of red and blue stripes. "I'm not going to hurt you, Sonny. Tell me if you feel anything." Of course, I read that MOH circular (2601 of March 16): "The Minister of Health has decided to institute new awards for members of the Civil Nursing Reserve." Like Royalty. Stars for nursing auxiliaries and assistant nurses; stripes for trained nurses. One red one for each year's general service, and from now on a blue one for each year's hospital work if it includes at least three months in a sanatorium, tuberculosis ward or hospital, or a fever hospital. I wonder what a trade union would say if a political head started making awards to its members! And why should sanatorium work be classed as dangerous? Some of the big sanatoria have never had a case of

tubercle in a nurse, clearly contracted there. If we get a state medical service we'll get the same sort of thing—and they won't all be awards. "Dr. X has been sentenced to wear 3 bars sinister (black crêpe, 1 in. wide, to be worn 3 in. above the umbilicus) for over-prescribing—or not filling up Form VX999 in quintuplicate." "Sorry, Sonny, did I pinch you?" "What are the primroses for, Nurse? Oh, Primrose Day; Disraeli." There is no humour in politics or they could never have associated the guileless primrose with Dizzy, especially as his only recorded utterance on them is: "They say they make an uncommonly good salad." I wonder if he was really like Maurois's portrait—oily, opulent (in spite of the debts), grandiose, cynically discerning. Probably, for it is all confirmed by his almost unreadable novels, his epigrammatic, rhetorical young men with their ducal associations and Car-ears; absolute museum-pieces now. Even their successors, the dominion-over-palm-and-pine wallahs, are almost extinct. The pine and palm seem so damnably ungrateful. I wonder what this kid's generation will think of us. No eye-wash, jesting, trying to think clearly; perhaps that's about the most we can hope for. "There we are! How does that feel, Sonny?"

* * *

What better present for a war-time housewife than Mrs. Beeton's "Household Management"? There is nothing in it that she can do at present. Even the simplest recipe for afternoon tea scones needs an ounce of butter and a tablespoon of castor sugar for eight scones, while cream scones take three ounces of butter or margarine, a gill of milk, and half a gill of cream to the dozen. But the book is full of such things as dreams are made of—there are no fewer than twenty-five recipes for salmon, though only nine for herrings, but as these take from four to a dozen herrings each it would take some fifty to try them all. Then there are the pictures. If anyone begins to lack interest to see this war through let him look at the coloured plate of cheeses. The very music of their names has gone into our beings, not only Cheddar, Cheshire, Stilton and Wensleydale, but such romantic titles as Schabzieger, Mainzer, Koboko and Dunragit—but not Olmutz; this I met in Vienna in 1912 when I boarded with a bourgeois family of high intelligence. I tasted it once and ever after passed it as it came round the table with fully extended arms. And when tired of making one's mouth water with recipes, there are many other things we can study. Mistresses can learn how to manage maids now there are none to manage, and a husband can study the extent to which he is liable for debts contracted by his wife and be glad that he is not now, by reason of being her husband, liable for a tort committed by her. Just now we naturally turn to Mrs. B's chapter on vegetarian cookery to see whether we can get help with what Lord Woolton tells us about having to live more and more on vegetables. There is not so much guidance as we would wish, since she is writing under what Mr. Trotter called a "biological anomaly in the situation of man" resulting from "the effects of unrestricted food-supply." Now for the first time in the history of our nation we are likely to be living with a restricted food-supply, largely vegetable, under a code which does not allow the rich to gorge while the poor starve. Under these new conditions we have to consider a calorie value to be obtained largely from the potato and the pulses; and variety in taste and flavour will loom large in next year's cookery. When we consult Mrs. Beeton we realise how much this variation depends on fats and milk, and on jam, sugar and syrups. Thus green-pea soup includes "¼ pint of milk, or milk and cream," brown vegetable soup "1 tablespoon of oil or 1 oz. of butter." A carrot pudding takes 2 oz. of butter for 2 persons and potato pie 1 oz. for 3 or 4. Even nut preparations take "1 pint of milk, 2 or 3 tablespoons of cream and 1 oz. of butter or margarine" for the fricassee, and for the galantine "some Béchamel sauce (p. 192)," and when one turns to page 192 we find that sauce Béchamel takes 2 oz. of butter and 1¼ pints of milk to make 1 pint. Housewives had better get past the stage of experimental cookery while there are yet other foods for their husbands and their children; so that there may be better feeding and less grousing when we become compulsory vegetarians next winter, and even then they will be faced with the fuel problem Thus savoury lentils must be cooked for two hours and Scotch stew takes three to make. The gas ring going all this time will make a heavy load on the fuel ration.

These vegetarian foods seem to be infernally expensive, or we might all rush for them. A friend of mine bought some almond nut-meat. He describes it as being "like a completely inert galantine, unobjectionable but quite tasteless," but it cost him 2*s.* for a small tin. I suppose vegetarians are still mostly persons of independent means as well as thought, and it must take a lot of almonds to make a pound of meat, so probably this is a legitimate price. Other nut-meats are cheaper, I gather, but I fear they will taste of pea-nut. Vegetarians would not be keen on seeing their staple foods snapped up by the carnivorous general public, but if we can gather more beans and peas this season we can boost up our protein intake without encroaching on their nuts, and in return perhaps they will tell us how to cook a haricot so it will taste like steak and onions.

* * *

Most people will agree nowadays about giving sex instruction to youngsters, but this raises another matter. "We have now in the school," writes a schoolmaster to me, "an intelligent and energetic boy of 14 who asked me outright to illuminate his darkness. I did so and the boy remarked, 'It would make all the difference if everybody understood that part about the taboo.'" Schoolboys, and schoolgirls too, talk of these things and use words that are now unutterable for grown-ups, though known to Shakespeare and often of respectable ancestry. We have invested them with a taboo as rigid and irrational as anything discovered by Captain Cook. My schoolmaster friend has discovered that only by accepting this vocabulary is he able to gain that confidence from them of which his letter gives evidence. The essence of taboo is that it is irrational, unquestionable, and the violation of it is associated with the dread of an unknown penalty. This is true of Polynesia and England. A writer in the *Times* lately told of a brave little boy who spelt *sum-wun* and was jeered at by his elder sisters. Says the writer, "I saw the dawn of unintelligence on his face." If irrational spelling can give birth to unintelligence, what about irrational emotional emphasis on words? It is a defensible proposition that much of the muddled thinking of today is built up on this worship of the black magic of words. This schoolmaster explains the taboo to his boys. I know from my own family experience that the child will accept the taboo as a rather silly part of the world around it and take reasonable care not to offend it. But, without understanding, the taboo is a source of psychoneurotic fears both in childhood and later life. A big question and one that is bound to rouse warmth of feeling.

* * *

It was rather tedious waiting for Mrs. Barwell to deliver herself of her fourth. Last time she had albuminuria and a stillborn child which shook her confidence; moreover, she is not so young as she was. Downstairs, Mr. Barwell, his 13-year-old son and I beguiled the time by discussing the value of education. It seemed that father and son had had some difference of opinion on the subject, and, rather meanly I thought, father brought me up as a reinforcement. With as much pomposity as I could muster I told Master Barwell how many gallons of midnight oil I had burnt, how many difficult examinations I had passed before being granted the privilege of sitting around for several hours after a hard day's work waiting for babies to be born, but he seemed curiously unimpressed. "But wouldn't *you* like to be a doctor, my boy?" I asked. "Cor, no," was the emphatic reply, "I wants vor to join the Navy." "Even so," I said, "a high standard of education will stand you in good stead." He shook his head, "'Tis no use learnin' wot they teaches you to school. They learns you all you 'as to know arter you goes een," he explained. Sadly I mounted the stairs to receive Mrs. Barwell's nine and a half pounder. "What do you want to get such big babies for?" I asked Mr. Barwell as he brought up another jug of hot water. "'Tis naught to do wi' me, doctor," he said, "I only doos the tillin'."

MEDICINE AND THE LAW

Hospital's Liability for Negligence of Staff

THE liability of a hospital for the alleged negligence of its technical staff was explored once again in the case of Gold *v.* Essex County Council, decided by Mr. Justice Tucker last January. A child was received at the Oldchurch County Hospital for treatment for warts on the face. The medical officer passed her to the radiology department with written instructions for her treatment, including the application of 1000 units of *grenz* rays. A radiographer gave this treatment several times, first protecting the patient's face with a screen of rubber lined with lead and placing a layer of lint underneath. One day the doctor ordered the units to be increased to 2000; on this occasion the radiographer omitted to use the lead and rubber screen, considering that the lint would be sufficient protection. Ulcers developed and caused permanent disfigurement. The plaintiff claimed damages against the county council on the ground of the negligence of the radiographer for whom the council were responsible; a further allegation was that the council were negligent in employing an incompetent technician. The judge found that the radiographer was negligent in omitting to use the same protection when 2000 units were applied as he had previously employed. There was evidence, however, that the radiographer was an excellent and trustworthy man, in every way satisfactory. This disposed of the allegation that the council had been negligent in employing him. The question remained whether the hospital authority could be responsible for the negligence of its technician.

The English courts at present follow the well-known ruling given by Lord Justice Kennedy in 1909 in Hillyer *v.* St. Bartholomew's Hospital. The governors of a public hospital, in admitting a patient to gratuitous treatment, undertake that the patient shall be treated only by experts, "whether surgeons, physicians or nurses," of whose professional competence the governors have taken reasonable care to assure themselves. But they do not make themselves liable in damages if members of the professional staff, being competent persons, act negligently in some matter of professional care, though, as Lord Justice Kennedy went on to say, it might be that the hospital would be legally responsible to patients for the due performance of its servant's "purely ministerial or administrative duties." The Hillyer case has been considered several times in recent years, in particular by Mr. Justice Swift in James *v.* Probyn (1935), Mr. Justice Horridge in Strangways-Lesmere *v.* Clayton (1936) and Mr. Justice Finlay in Dryden *v.* Surrey County Council (1936). All three judges followed Lord Justice Kennedy. Mr. Justice Swift observed that the duties of doctors and nurses are the duties of skilled people, to be carried out by skilled people; "the actions of doctors and nurses cannot be controlled, in my opinion, by members of a committee who do not for one moment pretend that they have the knowledge or ability to perform these duties themselves."

On the other side there is an opinion by Lord Alness in the Scottish case of Lavelle *v.* Glasgow Royal Infirmary (1932) where a patient was said to have suffered injuries through the negligence of a nurse. Lord Alness was unable to agree that the staff of a hospital when performing their professional duties can be in any different legal position from that which they occupy when performing ministerial or administrative duties. In the recent case of Gold Mr. Justice Tucker was pressed with the argument that the radiographer should be described as a technician, a man holding a position requiring skill and training, but none the less differing from an operating surgeon and approximating rather to the same category as a nurse. Hospital authorities, it was contended, ought to be responsible for the negligence of a nurse—at any rate outside the actual operating theatre.

In 1938 the Supreme Court of Canada reviewed the British cases exhaustively in Sisters of St. Joseph *v.* Fleming and decided in favour of the view of Lord Alness rather than that of Lord Justice Kennedy. It is worth noting that both Mr. Justice Swift in James *v.* Probyn and Mr. Justice Tucker in the recent Gold case confessed that the reasoning of Lord Alness was attractive. The Hillyer decision, however, was given by the Court of Appeal and the judges of the King's Bench Division hold themselves bound by it. The House of Lords, if occasion arose, could overrule it. The Hillyer decision was mentioned in the House of Lords in 1937 during the argument in Lindsey County Council *v.* Marshall. The supreme appellate tribunal decided against the hospital authority in the Marshall case but an effort was made to distinguish the case of Hillyer. Lord Chancellor Hailsham was careful to say that nothing in the Marshall case must be taken as throwing doubt on the Hillyer decision. And there, for the present, the matter stands.

Parliament

ON THE FLOOR OF THE HOUSE

MEDICUS M.P.

THE announcement by the Lord President of the Council of the setting up of invasion committees affects every part of the country according to its vulnerability and importance, and the functioning of these committees is of great consequence to the medical profession. There can obviously be no pattern of invasion organisation for general use, except in barest outline, but in any locality the private practitioner will be in a key position. He will be a centre of information to the Services and civilians alike on medical arrangements for illness and casualties. The invasion committees are a responsibility of the defence regions of the country and the medical officers of the regions are acquainted with arrangements in detail. But like food distribution and emergency shelter quarters the provision of medical care remains "primarily a local problem," and Parliament has rightly handed this aspect of local administration to the localities.

* * *

Most of last week before the adjournment of the House for a short recess was taken up by a debate on production in which the new Minister, Mr. Lyttelton, presented his plan of campaign to an appreciative audience. Mr. Messer had some criticisms to make of the factory medical service, especially in Royal Ordnance factories. Though the service is being extended it does not yet cover more than a small part of the total personnel in factories. Yet the increasing employment of juveniles for long hours calls for vigilance. Mr. Chuter Ede, parliamentary secretary to the Board of Education, has just stated that the school medical service cannot be extended to cover the 14–18 group. The urgent need for some form of medical supervision was again brought out by the debate in the House of Lords, when Lord Gainford raised the question of hours of work for children under 16 in the potteries and in the cotton industry. He suggested that this juvenile labour should be replaced by women, and the orders for permitting the extension of hours of work to over fifty a week rescinded "since they involve the sacrifice of the children's interests." Lord Gainford hopes for a further debate at an early date and the House of Commons will no doubt also bring the matter up again.

* * *

A curious sideline of parliamentary work was in an answer on the Maby Dowsing experiment. Mr. Maby is a gentleman who claims to be able to locate minerals, including unexploded bombs, by dowsing. He has been employed by the Admiralty, War Office and Air Ministry. It is true the total amount of money spent is only £58 plus minor expenditure for travelling, but the results of the scientific tests, carried out at Mr. Maby's desire, have not led to an extension of the work. One M.P. when questions were being asked wished to know whether the Government would now consider employing astrologers.

FROM THE PRESS GALLERY

Medical Care of the Worker

In the course of the debate on war production Mr. F. MESSER said that man-power was being wasted in the health of the workers. He had no doubt that much miscalled idle time was due to the physical condition of the workers who had arrived at a stage physically where it was necessary for there to be some break. Mr. Messer welcomed the introduction of the factory medical service, but he was not sure that the best use was being made of it. Some managers assumed that all that is required is for some corner of the factory to be set aside for first-aid. An efficient medical service would prevent much illness. There were about forty Royal Ordnance factories, employing about a hundred medical men. The first requirement of that service was the appointment of a suitable senior officer. At the moment the head was Sir David Munro, who was also secretary of the Industrial Research Board and he believed did other things as well. Sir David could not do the necessary planning if his interests were engaged in so many ways. Mr. Messer knew that Sir David had a very efficient deputy who did his work in his absence, but in the absence of the deputy the executive work was done by a woman who was not even a doctor, and so far as he knew had no knowledge of industrial medicine. At Woolwich Arsenal an army officer, Colonel Johnson, was in charge, a doctor who had had no previous knowledge of industrial medicine, while the staff had been selected because of their knowledge of industrial medicine. Friction was bound to occur. The result was that there had been something like nine resignations and transfers from that important factory within twelve months and the Government had lost the services of some valuable people, including Dr. Hilda White, who was known in the medical profession for her research work and knowledge of industrial medicine. It would be interesting if the Minister would call for her letter of resignation and note the reason. Many workers going into the factories today were inexperienced and he would like to see a table showing the numbers of cases, for instance, of dermatitis and how the increase in percentages and proportions resulted from lack of knowledge.

Mr. R. ASSHETON, parliamentary secretary to the Ministry of Supply, said that Sir David Munro was a distinguished doctor, with wide contacts in the field of industrial medicine which had been of great value to the ministry, and it was thought that the ministry should not lose the advantage of those contacts. Dr. Amor had been appointed as Sir David's deputy, so that the increasing work of the medical services might be properly administered from headquarters. Mr. Messer had suggested that the doctor in charge of the medical service at Woolwich was without previous knowledge of industrial medicine, but Colonel Johnson had been medical officer in a number of factories. Mr. Messer had also asserted that there had been nine resignations and transfers from Woolwich during the past year. There had been one resignation, Dr. White, and she resigned because circumstances made it difficult for her to take night duty in rotation with the other members of the medical staff. There had also been six transfers of medical staff within the period, but all of these had been within the Ministry of Supply medical service, either to the regions or to the ministry's factories in the country. Woolwich had been used as a training ground and it was normal for these people to be sent out from it. The Government were not only fully aware of the danger of dermatitis, but were taking all possible measures, both curative and preventive, against it.

Expenditure on Social Services

The statement giving the figures for expenditure on social services for 1939 and 1940 appeared in the Official Report for March 24, col. 1827.

QUESTION TIME

Shortening the Waiting-list

Up to the end of last week the number of patients in Scotland referred from the waiting-lists of voluntary hospitals, and treated in associated Emergency Scheme Hospitals was 3210, of whom 1125 were referred since the widening of the scheme announced at the beginning of this year. (Mr. T. JOHNSTON replying to Mr. H. MCNEIL.)

Restrictions on Diathermy Apparatus

Sir ERNEST GRAHAM-LITTLE asked the Minister of Health whether he would inquire into, with a view to remedying, the case, details of which had been furnished to him, of a British woman physician of high professional standing and reputation, who had been refused permission to continue the use of diathermy apparatus upon which her extensive practice and research work depended.—Mr. W. S. MORRISON, postmaster general, replied: I have received a joint deputation from the British Medical Association and the Parliamentary Medical Committee in regard to the restrictions at present placed on the use of electrical diathermy apparatus, and I have the matter under consideration.

Medical War Committees and Home Guard

Mr. T. E. GROVES asked the Under Secretary of State for War what complaints he had received about the dilatory action of local medical war committees and their refusal to hear representatives of the Home Guard when discussing Home Guard affairs and whether he proposed to take any steps towards improving the existing situation.—Mr. D. SANDYS replied: Very few complaints have been received and these have been looked into. An Army Council instruction, whose terms have been agreed with the Central Medical War Committee, will be published shortly and should remove any misunderstandings.

BACTERIOLOGY IN THE FRENCH CONGO

WHILE the present cloud hangs over the parent Pasteur Institute in Paris it is heartening to learn of the activities of its daughter institute in Brazzaville some thousands of miles away in French Congo. The report for 1940 of the director, Dr. Jean Ceccaldi, is a tribute not only to the keenness of the staff but also to the far-seeing energy of Monsieur Eboué, the governor-general, who has been responsible for many developments—strategic roads, native policy and so on—since Equatorial Africa rallied to de Gaulle. The report deals mostly with routine work, for research has had to be curtailed. Some 900 blood-examinations were performed in Europeans and 650 in natives. Discoveries new to the colony were *Spirillum minus* and *Spirochæta duttoni*, the former from a Portuguese who had been bitten by a rat. In sputum of native cases of pulmonary tuberculosis symbiosis of *Spirochæta bronchialis* with the tubercle bacillus has been confirmed. Seven cases of leprosy were diagnosed, in four of whom the organisms were demonstrated in the nasal mucus.

The preparation of vaccines was one of the main activities of the institute, because of the large demand for meningococcal vaccine, of which nearly 400 litres was produced during the year. Cerebrospinal fever runs a regular cycle in the colony, appearing in the dry season and disappearing with the first rains; the report expresses confidence in the prospects of prophylactic inoculation. The anti-rabies department has continued to employ the *virus fixe* from Paris, which is now in its 187th passage. A carbolised preparation is dispatched to every part of the colony, and 48 treatments have been administered. Typhoid fever has appeared in Brazzaville and six strains were isolated during the year, three being in Europeans. Neurotropic yellow-fever virus is being maintained and is now in its 407th passage. By the mouse-protection test it was proved that an epidemic of malignant jaundice was not yellow fever.

In the sleeping-sickness service only 2 new cases were diagnosed in Europeans, though there were over 200 in natives. Analysis of the diagnostic measures adopted is instructive. In 209 cases, 42 were by gland-puncture; 2 by triple centrifugation; 10 by triple centrifugation and thick-drop method; 42 by gland-puncture, triple centrifugation and thick drop; 19 by gland puncture and cerebrospinal fluid; 1 by triple centrifugation and c.s.f.; 1 by gland-puncture, thick-drop and c.s.f.; 11 by thick drop, triple centrifugation and c.s.f.; 44 by gland-puncture, triple centrifugation, thick drop and c.s.f.; 40 by c.s.f. alone. Several cases of reinfection with trypanosomes after a ten-year interval of freedom were discovered.

Continued at foot of next page

Letters to the Editor

TRAINING COURSES FOR THE UNFIT

SIR,—Colonel Howitt and Major Wesson are correct in saying that the work of the Army School of Physical Training is too little known. This school is the most interesting and profitable experiment in social medicine that has been made for many years. Those who, before the war, were privileged to visit it cannot fail to be impressed with the amazing improvement in the physique of substandard recruits. For this reason alone, their account of the school's work in war-time is very welcome.

I am writing to ask why experiments of this type need be confined to the armed forces. It seems a paradox, now the fitter men and women of the nation are being drafted into the Services, that any attempt to improve the less fit should be limited to preparations for slaughter. Industry has now to maintain production by the labour of the less fit, and even frankly ill, members of the community. Ex-miners are asked to return to the mines (involving very heavy work) "unfit" men to undertake heavy work, and women to undertake men's work. All this after many years of life on a minimal diet and without any attempt at physical training. No doubt, many men and women are able to adapt their bodies to unaccustomed heavy work, but many after a hopeless attempt are merely exhausted and ill.

I suggest that organised and disciplined courses of physical training would, especially in industries such as mining, do much, with proper feeding, to help those entering or returning to the industry to fit themselves for heavy work and hence to maintain production and decrease absenteeism, which is often a reflection of undefinable illhealth or exhaustion. Rehabilitation centres are being organised for the industrially injured; why not training courses, if necessary compulsory, for the industrially unfit? The two problems are closely related.

Southwell, Notts. T. A. LLOYD DAVIES.

DOSAGE OF INSULIN

SIR,—Is not Dr. Barnard's suggestion to abolish the different strengths of insulin rather a drastic method of avoiding errors in dosage? Surely the fact that certain members of our community want to be spoon-fed is no reason to do away with a refinement of treatment. I realise the difficulty and have met few nurses and no patients who knew how to draw up a certain number of units of double-strength insulin in a unit syringe. But this difficulty is only produced by our method of prescribing. I now tell all my patients to get a syringe marked in cubic centimetres and prescribe the insulin accordingly. It takes not much mathematical understanding to realise that double-strength insulin 1·0 c.cm. corresponds to single-strength insulin 2·0 c.cm. or quadruple-strength insulin 0·5 c.cm., and the doctor knows that it all means 40 units.

Coventry. G. BEHR.

TRAUMA AND LEUKÆMIA

SIR,—In your annotation of March 7 you raise again the question of trauma as an ætiological factor in leukæmia. My article in the *Lancet* in 1930 (i, 288) commented on the fact that, with one doubtful exception, all the cases collected, including my own, were of the myeloid type. In a letter to the *British Medical Journal* a few months later I pointed out that, since the likelihood of accidental trauma preceding leukæmia was equal for the two main varieties, one would expect that these cases, wrongly interpreted as traumatic leukæmia, would occur in the proportional incidence of the two main types, myeloid and lymphatic. The fact that all the cases I have described were of the myeloid variety suggested an authentic association with the previous trauma. I submit that the reporting latterly of two cases of lymphatic leukæmia associated with trauma does not invalidate this argument. It would indeed be surprising if the various components of the hæmatopoietic system were not to some extent susceptible to the same ætiological influences, though specific portions, such as non-granular formative tissue, might not be as strategically situated for, or sensitive to, that type of stimulus. The dispersed nature of the myeloid tumour makes Ewing's sixth criterion inapplicable; many of my cases conform to the rest of the criteria. I am glad to note that as critical a mind as Prof. Henry Cohen's is prepared to consider Ewing's criteria as sound. I do not think that undue significance need be attached to the fact that my case failed to convince the courts. My experience of the procedure and judgment on that occasion convinces me that medical assessors for medical litigations would be a progressive step in the post-war world now being planned.

London, N.W.8. S. CHARLES LEWSEN.

FRACTURES OF THE FEMORAL NECK

SIR,—Some recent writers on the treatment of fractures of the femoral neck have omitted to emphasise the senile condition of most of the sufferers or the tendency of the senile to break up as the result of such an injury or being put to bed or both. Even if an ambulatory device such as the Whitman plaster or a walking calliper is applied, many of the cases to be found particularly in local government hospitals (where orthopædists sometimes find salutary experience) will not or cannot get about again, and thus avoid the liability to fatal hypostatic pulmonary congestion or bedsores; quite a number of them have barely been able to walk before they were injured (and hence the injury often). In other words, the degree of senility often renders the patient unable to avail himself of the treatment, however skilful, provided for his injury, or even renders treatment of the fracture apart from relieving discomfort unnecessary. It should surely be taught that the condition of the patient and his history should determine the treatment, if any, to be employed, and influence the prognosis vastly more than the method of treatment adopted.

Worksop. M. HAYDON-BAILLIE.

RESUSCITATION IN SHOCK

SIR,—The pathogenesis of shock—its differentiation from collapse—must be left. Certainly transfusion is sound; but its abuse should be avoided. Timely venesection may, perhaps, hereafter diminish the number of the victims dying from massive transfusion[1]; but as yet no-one dealing with these cases recognises such sequence, despite the case and post-mortem reports (*Brit. med. J.* 1941, i, 427 ff.). Even though the pronouncement of these latter should be uncertain, which it is not, general experience teaches that excesses of any kind are inimical to health. That the blood-volume matters will be perceived in time. Dr. Dunlop must agree (*Lancet*, 1942, i, 384). He is appalled by the present-day practice of giving plasma and blood almost without limit to every case of shock. As he says, the modern house-surgeon has not heard of the effect of coffee per rectum. The truth is that the modern house-surgeon is imbued with the toxæmic origin of shock, and conceives that only massive transfusions combat it; perhaps as he gets older his views may alter.

Excellent as may be the results of moderate transfusion, this procedure is not the only egg in the therapeutic basket. There is something one can do more quickly than transfuse the patient, one without the risk of causing septicæmia (cf. case III, Bywaters and Beall, *Brit. med. J.* 1941, i, 430). It consists in placing the patient in the Trendelenburg position. After all, the thing that matters most in shock is to conserve the cerebral circulation, to keep the vital centres alive, and, unless the patient is moribund, the Trendelenburg position ensures that. In wounded men it is especially important: it tends to prevent bleeding, the loss of precious blood. Just as the aortic pressure is less in the

1. "We little know how many under disease, perish by large bleedings. . . . Timely transfusion may, perhaps, hereafter diminish the numbers of these victims." (Blundell, *J. Lancet*, 1828, ii, 486).

BACTERIOLOGY IN THE FRENCH CONGO (*continued*)

The director of the veterinary department left for active service at the beginning of the war, so research in animal pathology has had to be suspended. At the agricultural research station a severe epidemic of avian diphtheria ravaged the fowl-house; it only attacked birds under 4 months old, but in these the fatality was 90–95%.

horizontal position compared with that when standing, so we may believe that in the Trendelenburg position the aortic pressure is less than in the horizontal. When a patient is in the raised pelvic position, the long axis of the body being at 45° to the horizontal, the pressure in the bladder, says Trendelenburg,[2] may fall to minus-10 cm. of water, while in the horizontal position this pressure is positive. Not only the viscera fall towards the diaphragm, but also the blood in the great veins. The Trendelenburg position not only tends to prevent or limit bleeding, it tends to prevent the occurrence of shock. It must have this effect in wounded men just as it has this effect in patients under spinal anæsthesia: without this position, spinal anæsthesia would be impossible—with the patient in the horizontal position a fatal issue would occur in every case. If wounded men on the battle-field were brought in on stretchers in the Trendelenburg position and transported in an ambulance in this position (which could easily be arranged), if they were put to bed in this position and any necessary operation were performed in this position (the patients being conveyed to and brought back from the theatre in this position), and if they were subsequently nursed in this position, until all signs of shock had disappeared, the results, I think, would be very different from what they were during the last war, and from what perhaps they may be in this.

Rugby. R. H. PARAMORE.

MIGRATION OF FOREIGN BODIES

SIR,—Prof. Lambert Rogers's letter in your issue of March 28 prompts me to record the following example of a foreign body in the chest that I saw when resident medical officer of the London Chest Hospital in 1934.

A housewife, aged 26, was admitted to the hospital under the care of Dr. H. V. Morlock, with a history of intermittent sharp pain in the left side of the chest for 4 years, a dry unproductive cough for 10 months, and two small frank hæmoptyses that finally persuaded her to seek medical advice. Antero-posterior and lateral X-ray pictures of the chest revealed a needle in the central portion of the left lung in close relation to the heart border and about 1 in. above the diaphragm. After induction of a preliminary pneumothorax the chest was explored by Mr. W. H. C. Romanis and Mr. T. Holmes Sellors. The needle was felt embedded in the lung with the point obliquely buried in parietal pericardium for a short distance. It was friable and broke into fragments during dissection. It was completely removed piecemeal, the lung was repaired and an uninterrupted recovery followed.

The patient could supply no information to explain how this needle, which was a medium-sized domestic sewing needle, came to be in her chest. She had no recollection of ever being pricked. The case affords an example of the migratory tendency of sharply pointed foreign bodies and of how their first lodgement in the tissues can pass quite unsuspected.

Harley Street, W.1. N. LLOYD RUSBY.

PERFORATED PEPTIC ULCER DURING AIR-RAIDING

SIR,—There are two questions we should like to ask Dr. Jennings, or indeed anyone else. The first is: if the air-raid increases reported in Liverpool, Bristol and London were not mainly due to anxiety, hurried meals, and possibly anxious over-smoking, what were they due to? And, whatever the ætiology of peptic ulcers—acid, bacteria or embolus—surely D. T. Davies and A. T. M. Wilson (*Lancet*, 1937, ii, 1353; 1939, ii, 723) have shown that anxiety plays a noteworthy part in at any rate facilitating chronic and dangerous ulcers? The fact that hypothalamic damage can cause ulceration is of course, as Dr. Jennings says, no evidence that this is the actual mechanism in patients; but it does show that higher-centre stimuli can cause damage to the stomach, and therefore that emotional disturbance would at least have a mechanism by which to work. The second question is: supposing for a moment that anxiety is an important factor in the ætiology, need we libel our grandmothers, as Dr. Jennings suggests we need, by saying that the fact that young women perforated with twenty times the relative frequency must mean that they were twenty times as anxious? Is it not possible that young women perforate just as frequently as they ever did, but older women and all ages of men far more frequently? In fifty years ending in 1903 Brünner collected 170 perforations in young ladies between 17 and 26; today, aided of course by the tendency to publish operation statistics which could not have existed long before Brünner's time, it would be easy to find far more cases in the same age-group in the same period. Does the relative decrease in female, and especially young female, perforations represent a numerical decrease in female cases, a numerical increase in male cases, or both? We have learnt so much from Dr. Jennings's paper (*Lancet*, 1940, i, 395) that we hope he can tell us the answer to this question as well.

Charing Cross Hospital Medical School, W.C.2. D. N. STEWART. D. M. DE R. WINSER.

2. Trendelenburg, F. Sammlung klinischer Vorträge, 1886-90, No. 355 (1).

SUTURE MATERIAL

SIR,—Your annotation (March 14, p. 329) seems to have been directed partly with an eye to economy, and partly in recognition of the increased use of non-absorbable sutures. With the first point in mind may I draw attention to the advantages and economy to be derived from the use of stainless-steel wire for superficial sutures. The wire is still available in a variety of gauges, but 40 gauge (4·8 mils.) is a very useful size, having the thickness of fine horsehair, with much greater tensile strength. It can thus be used for suturing under tension which horsehair would not take, with consequent advantage in cosmetic result. Its chief attraction is that, though the wire is softly flexible and painless on removal, it has sufficient rigidity to make the first knot absolutely secure, and as a consequence the pressure and position of the opposing skin edges can be nicely calculated. The slight stiffness of the wire gives no increased difficulty in tying. In situations like the face it is unnecessary to tie a second knot. As the wound heals, and the œdema of the wound lips subsides, the wire is left standing up like a hoop, for easy removal. The cheapness, ease of sterilisation by boiling, absence of deterioration, will be obvious to any one using the material. As an aid to the hair-line suturing of scars, there is nothing to equal it. The tissues show no reaction, and the subsequent scars are cosmetically excellent. The use of higher gauge wires than 20 (36 mils.) is not recommended, as once past a certain diameter its rigidity makes its use objectionable, though it still retains certain advantages.

White Lodge Hospital, Newmarket. J. GRANT BONNIN.

THE NATIONAL LOAF

SIR,—The decision of the Minister of Food to prohibit the milling of white flour, except under very restricted conditions, and to provide, for the national war bread exclusively, wheatmeal flour of 85% extraction, is welcome, but since the new loaf is to be compulsory an examination of exactly what we have to expect in it is imperative. A statutory order dated March 11, 1942, contains the following specification:—

"National wheatmeal" means, in relation to flour produced after the 22nd day of March 1942, flour of 85% extraction, produced in the United Kingdom, so as to contain the maximum quantity of wheat germ which, having regard to the type of milling plant, can be included in such flour but so as not to include any course bran.

It will be noted that the quantity of wheat germ to be included depends upon the type of milling plant used. This seems an unfortunate stipulation. It again leaves to the millers the decision as to the most important constituent of bread, and introduces an element of mystification and confusion: factors which militated so gravely against the public acceptance of the national wheatmeal loaf during the year of its trial.

Recent public statements by the minister indicate (1) that calcium is to be added to the national loaf but not vitamin B_1, and (2) that it will be lawful for the bakers to add 25% of white flour in making the national bread "until stocks are exhausted." As the minister, however, has announced that the import of Canadian white flour of 70–73% extraction will be continued, to be added to "security stocks," the date of their exhausation would

seem indefinitely postponed, and consequently the supply of national bread, of which only 75% will be of 85% extraction, will be correspondingly prolonged. The provision of 100% extraction flour would at once put a stop to this uncertainty of composition of the war bread, the factor which was perhaps the most important reason for the failure of the ministry's wheatmeal loaf.

Dr. Harriette Chick's article in your last issue adduces some important new data demonstrating the superiority of 100% wholemeal over 85% national wheatmeal in protein content. The diminution, amounting to the virtual disappearance, of meat, milk, cheese and eggs from the diet of the vast majority of our people, makes it all the more necessary to secure the maximum quantity of protein that bread can furnish; when one adds the value for the poorer population of the protective substances, of which again bread is the principal and in some circumstances almost the only source, the choice of whole-grain flour in preference to wheatmeal is surely inescapable.

Utilisation of the whole of the wheat grain for human food would effect an additional saving of 10–15% (estimated at about 700,000 tons a year) over and above the saving from substituting 85% (wheatmeal) for the 70–75% white flour. The imperious necessity of economising shipping space has been emphasised by two very serious ministerial announcements: thus the Prime Minister declared that the shipping position in the Atlantic has "worsened" of late, and the Parliamentary Secretary to the Ministry of Agriculture has twice given the warning that "the food situation is graver than it has ever been." In such a critical phase of our fortunes I submit that the public will not, and should not, be satisfied with anything less than complete utilisation of imported wheat for the national bread, and I hope our profession will now exert all its influence in favour of a 100% extraction war bread.

House of Commons. E. GRAHAM-LITTLE.

PROGNOSIS OF MENTAL INSTABILITY

SIR,—In your issue of March 28 (p. 377) Drs. Barton Hall state "Harris (1938), investigating 123 cases of anxiety neurosis . . . found 31% to be well, a term which he did not define, 10 years later." If one reads the section of my paper headed Classification of Cases, I think it should be fairly clear that I used the term "well" to mean free from symptoms.

Bryanston Court, W.1. A. HARRIS.

ANTISEPTIC EMULSIONS

SIR,—In the paper by Heggie et al. (March 21, p. 347) on the treatment of superficial granulating areas frequent references are made to water-in-oil and oil-in-water types of emulsions and formulæ are given for a number of preparations. I would like to know how these workers vary the type of emulsion by simply varying the quantities of the similar constituents, and how they produce a water-in-oil emulsion using 'Lanette Wax SX' as the emulsifying agent. This is contrary to the maker's statement about its properties and to my own experience in using it.

St. Bartholomew's Hospital, E.C.1. JAMES COUTTS.

REGISTER OF ORTHOPTISTS.—The Board of Registration of Medical Auxiliaries have issued a new edition (1942) of their register of orthoptists. Medical practitioners and hospital authorities may obtain free copies of the register from the secretary of the board, BMA House, Tavistock Square, London, W.C.1.

'HEPASTAB FORTE.'—Under this name Messrs. Boots have put on the market a concentrated liver extract for intramuscular or intravenous injection. It is obtainable in 2 c.cm. ampoules and in 10 c.cm. or 25 c.cm. rubber-capped vials. Each 2 c.cm. of the extract is obtained from 100 g. of liver and is therapeutically equivalent to 4000–5000 g. of fresh liver by mouth.

'BENERVA COMPOUND VITAMIN TABLETS,' now issued by Roche Products, each contain 1 mg. of aneurine (vitamin B_1), 1 mg. of riboflavin and 15 mg. of nicotinic acid, the three factors of the vitamin-B complex for which there are definite clinical indications. 'Benerva,' on the other hand, contains aneurine only.

Obituary

HUGH MILTON STEWART

M.D. CAMB.

"Stewart of Dulwich," who died at Guy's Hospital on Feb. 23, earned his affectionate title by nearly fifty years of keen work in the Borough as surgeon to Sydenham Children's Hospital, as medical officer to Dulwich College, and as honorary to local charitable institutions. Hugh Milton Stewart was born at Port Elizabeth, Natal, in 1868, but was educated in England at Dulwich College and at Christ's College, Cambridge, where he obtained a first-class in the natural sciences tripos. He entered Guy's with a scholarship, and after graduation in 1894 held resident posts at the hospital. His early bent was towards hospital and consultant work, but in 1895 he joined an old-established practice in Dulwich. One of his medical friends writes: Stewart's kindly tolerance never faltered; his judgment of his fellows was sound, but he spoke evil of no man. His culture was wide, his eye observant, and with him a chat over the fire, a walk in the country, or a stroll in the garden were stimulating pleasures. His wife, a sister of Sir Arthur Shipley, played a notable part in all his activities and shared his devotion to Guy's. He leaves her with two daughters and two sons—one a doctor.

DR. JOHN JAMES FRASER RUSSELL, whose death in action is reported, qualified from the University of Edinburgh in 1933. When war broke out he was in practice in Cape Town. One of his Edinburgh contemporaries remembers him as sturdy in physique, diligent in study, and somewhat grave in temperament. He had an air of maturity, uncommon in undergraduates, but his kindly manner won him an unassuming popularity.

Medical News

Royal College of Physicians of London

At a comitia of the college held on March 30 Sir Charles Wilson was re-elected president.

Diplomas in ophthalmic medicine and surgery and in tropical medicine and hygiene were granted, jointly with the Royal College of Surgeons, to those named in our issue of March 21 (p. 370) in a report of a meeting of the Royal College of Surgeons.

Society of Apothecaries of London

At a meeting of the court of assistants held on March 24, with Sir Stanley Woodwark, master, in the chair, Dr. J. P. Hedley was reappointed to represent the society on the Central Midwives Board. The following, having completed the final examination, were granted the diploma of the society entitling them to practise medicine, surgery and midwifery: G. J. Ambrose, St. Mary's; P. A. Eyre, St. Bart's; E. R. Jordan, Middlesex; and H. Kessel, Anderson Coll., Glasg.

Royal College of Obstetricians and Gynæcologists

At a recent examination for the diploma of the college the following were successful:—

Jean R. C. Burton-Brown, Mona M. Davin-Power, Margaret M. Flecker, Perla Greeves, S. J. Hadfield, Dorothy M. Hicks, Christia F. Lucas, J. K. Martin, Florence M. McClelland, R. J. Mitchell, Eileen E. Perry, E. E. Rawlings, Joyce M. Scholefield, Edith Scott, H. A. Shaw, and Dorothy M. Shotton.

St. John's Hospital for Diseases of the Skin, London

The times of attendance for outpatients at this hospital are 1-3 P.M. on Mondays to Fridays and, during the summer months, 5.30–6.30 P.M. on Tuesdays and Fridays.

Postgraduate Lectures in Edinburgh

The following Honyman Gillespie lectures will be given on Thursdays, at 4.30 P.M., at the Edinburgh Royal Infirmary during the summer term: April 23, Dr. I. Simson Hall, progressive middle-ear deafness; April 30, Dr. F. E. Reynolds, concerning cancer; May 7, Mr. R. C. Alexander, prostatic enlargement; May 14, Mr. W. O. Kernack, D.Sc., recent advances in chemotherapy; May 28, Mr. G. L. Alexander, surgical lesions of the spinal cord and nerve roots; June 11, Dr. Douglas Kerr, delinquency. The lectures are open to all graduates and senior students.

Medical Casualties

Lieut.-Colonel C. O. Shackleton, M.B. Durh., R.A.M.C., has been officially reported missing after the fall of Hong-Kong.

WS/Captain A. R. Duff, M.B. Edin., R.A.M.C., who was previously posted as wounded is now reported to be a prisoner of war.

Medical Honour

Temp. Surgeon Lieutenant D. C. Jackson, M.B. Melb., R.N.V.R., was among those awarded the D.S.C. for daring and resolution while serving in daylight attacks on the *Scharnhorst*, *Gneisenau* and *Prinz Eugen*.

London Association of the Medical Women's Federation

A meeting will be held at 3.30 P.M. on Friday, April 17, at BMA House, Tavistock Square, W.C.1, when Dr. R. D. Lawrence will speak on modern treatment with insulin.

Transfer of VD Educational Work

The British Social Hygiene Council has agreed that its educational work for the prevention and treatment of venereal diseases shall be transferred to the Central Council for Health Education. The Central Council is taking over staff and equipment so that the work may be continued without a break. The Minister of Health suggests that local authorities should transfer their contributions towards this work from the British Social Hygiene Council to the Central Council.

Course for the DPM

The Maudsley Hospital medical school is holding a course for the DPM from April 13 to June 5. Lectures on psychopathology and the principles and practical application of psychotherapy and on the pathology of the nervous system will be held at the Maudsley. There will also be clinical demonstrations at Banstead Hospital, St. Ebba's Hospital, Horton Emergency Hospital, and at West Park Hospital. Further particulars will be found in our advertisement columns.

Dr. G. I. Evans has been appointed Sheriff for Caernarvonshire.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in this paper should not be taken as an indication that they are necessarily available for export.

Births, Marriages and Deaths

BIRTHS

BEHRMAN.—On March 25, in London, the wife of Dr. Simon Behrman, of Harley Street—a daughter.

CHAMBERLAIN.—On April 3, at Farnham, the wife of Dr. J. Chamberlain—a daughter.

DANIEL.—On March 30, the wife of Dr. T. M. Daniel, of Sevenoaks—a son.

HANSON.—On April 2, at East Sheen, the wife of Captain E. H. Hanson, R.A.M.C.—a son.

HINDS HOWELL.—On April 3, in London, the wife of Major Anthony Hinds Howell, R.A.M.C.—a daughter.

OLLERENSHAW.—On April 2, at Altrincham, the wife of Surgeon Lieutenant Gerald Ollerenshaw, R.N.V.R.—a son.

O'SULLIVAN.—On March 31, in London, the wife of Mr. J. V. O'Sullivan, F.R.C.S.—a daughter.

PORTER.—On March 27, at New Milton, the wife of Captain Hugh Porter, R.A.M.C.—a son.

STAFFORD.—On March 26, at Sanderstead, the wife of Dr. Austin Stafford—a daughter.

WILLIAMS.—On March 31, at Plymouth, the wife of Surgeon Lieutenant-Commander A. Emlyn Williams, F.R.C.S., R.N.V.R.—a son.

MARRIAGES

DESMARAIS—KING.—On April 2, at Liverpool, Max Hervé Leopold Desmarais, captain R.A.M.C., of Curepipe, Mauritius, to Laura King, of Cheam, Surrey.

DEATHS

BROUGH.—On April 1, at Marlow, Battle, Daniel Brough, M.B. EDIN., D.P.H., aged 69.

FORSDIKE.—On March 29, at Bickenhall Mansions, London, W.1, Sidney Forsdike, M.D. EDIN., F.R.C.S.

MCNEILL.—On April 1, at Whickham, Newcastle-on-Tyne, George McNeill, M.B. EDIN., F.R.C.S.E., aged 64.

RILOT.—On March 30, at West Worthing, Charles Frederick Rilot, M.R.C.S., L.D.S., aged 77.

TAIT.—On March 30, at Towcester, Northants, Ralph Johnston Tait, M.B. EDIN., D.P.H., aged 54.

WARNER.—On March 28, at Market Drayton, Salop, Thomas Warner, M.D. LOND., F.R.C.S.

WILLIAMS.—On March 26, at Prestatyn, Alfred Ernest Williams, M.D. EDIN. D.P.H., medical officer of health for Flintshire, aged 65.

Notes, Comments and Abstracts

CHRISTIANITY, REASON AND DEMOCRACY

THE new Archbishop of Canterbury is not only the most prominent churchman but also one of the most lucid and influential thinkers of the day. In the opinion of Sidney Dark he has "nailed the red flag to the ecclesiastical mast." In 1941 he summoned a conference at Malvern which called for the abolition of private ownership of land and of the means of production, and asserted that the existing capitalist system is a "predisposing cause of war." In a pamphlet[1] of less than 40 small pages he now examines the relationship of democracy, reason and Christianity. He deplores the flight from reason, and discovers the causes for its exclusion from various forms of present-day political sovereignty. Only democracy, he concludes, can bear the weight of reason as a unifying force; but democracy and reason alone are quite insufficient to control man's enormous capacity for selfishness—a selfishness which should never be ignored in framing any political end. Reason does, however, enable us to be sensible of the other man's or nation's egoism and teach us to do justice to that egoism. Christianity has, he affirms, been always rooted in reason and is fully aware of man's egoism: "The Word was made flesh," not spirit, but it seeks to overcome that egoism by affirming the divine, not human, brotherhood. "Brotherhood, brotherhood," said Clemenceau, "yes, of course, Cain and Abel, Cain and Abel." But even those aware of the divine Fatherhood as reason for believing in a divine brotherhood worth striving for must never be unaware of the practical difficulties of a working Christianity, even in a democracy where authority derived from reason could be granted. It is a small work packed with thought on three immense subjects; but the end is mainly a plea to would-be practising Christians to use their reason and judgment to the utmost, and having used them to exercise forbearance with others who through the use of the same small powers have come to entirely opposite conclusions.

EVOLUTIONARY PROSPECTS

TIME was, the dinosaurs thought themselves the last word in evolution; but nature went on with her old game of "rub it out and do it again." With the hypermetropia natural to geologists, whose time scale is in millions of years, Prof. Eliot Blackwelder ("Science and Human Prospects." London: Watts & Co. Pp. 32. 6*d*.) looks into the distant future and tries to guess what is in store for us in another epoch. He points out that although primitive man has evolved continuously from cave man to civilised man, it does not follow that this evolution will continue on and on and up and up. Human palæontology indicates that what we loosely refer to as man comprised a group of at least five, and probably eight or more, distinct animal species grouped in several genera. These originated in various parts of the world, each lived many tens of thousands of years, but with one exception all became extinct. Today only one species survives and has held the field since the middle of the last glacial epoch, about 40,000 years ago. Other animal species of the past have followed career curves that involved a rise, culmination and decline. Fish, reptiles and giant birds were each in their turn lords of creation, but each was evicted by an upstart species, hitherto insignificant, but possessing those capacities of development that enabled it to adapt more successfully to a changing environment. Will our own species also reach its climax and deteriorate while a new species rises? Despite his progress in ways and ideas, man's actions are still governed more by his emotions than by his intellect. Professor Blackwelder guesses that man's successor will be able to absorb knowledge more rapidly and remember it better; he will have a keener imagination and be able to reason out his problems more effectively—and his life will be controlled by his intellect rather than his feelings. We shall not live to see the professor proved right, and man ousted from the scene by a superman; but in this present year of grace mankind appears to be anticipating both history and the professor, and is busy exterminating itself.

1. "Christian Democracy." William Temple, Archbishop of York. London: Student Christian Movement Press. Pp. 46. 6*d*.

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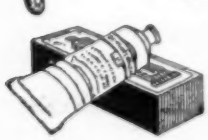

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At the MAUDSLEY HOSPITAL, Denmark Hill, S.E.5 :

Ten Lectures on Psychopathology, and the Principles and Practical Application of Psychotherapy. By W. H. Gillespie, M.D., M.R.C.P.

Eight Lectures with Demonstrations on Pathology of the Nervous System. By S. Nevin, M.D., F.R.C.P.

Six Clinical Demonstrations on the Psychoneuroses. By W. S. Maclay, M.D., M.R.C.P., D.P.M.

At BANSTEAD HOSPITAL FOR NERVOUS AND MENTAL DISORDERS, Sutton, Surrey :

Six Clinical Demonstrations on the Functional Psychoses. By A. A. W. Petrie, M.D., F.R.C.P.

At ST. EBBA'S HOSPITAL FOR NERVOUS AND MENTAL DISEASES, Epsom, Surrey :

Six Clinical Demonstrations on the Organic Psychoses. By Louis Minski, M.D., M.R.C.P., D.P.M.

Arrangements will also be made for Clinical Demonstrations at the Malarial Therapy Centre at HORTON EMERGENCY HOSPITAL, by W. D. Nicol, F.R.C.P., and at WEST PARK HOSPITAL FOR NERVOUS AND MENTAL DISEASES, by W. Alex. Caldwell, M.R.C.P., both at Epsom, Surrey.

The fee for the above series is £3 3s., which is payable at the commencement of the course.

Application for enrolment and inquiries should be addressed to Professor S. NEVIN, Honorary Director of the Medical School, The Central Pathological Laboratory, at West Park Hospital, Epsom, Surrey. Telephone No. : Epsom 1408.

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27th April to 1st May, 1942

Monday, 27th April	10 A.M.	Abdominal Emergencies ..	Lieut.-Col. W. Underwood, F.R.C.S.
	2 P.M.	Hernia and its Management	Surgeon Rear-Admiral C. P. G. Wakeley, C.B., F.R.C.S., F.R.A.C.S., F.A.C.S.
	3 P.M.	Strangulated Hernia ..	Mr. R. H. Franklin, F.R.C.S.
Tuesday, 28th April	10 A.M.	Genito-urinary Problems..	Mr. E. W. Riches, M.C., F.R.C.S.
	12.15 P.M.	Genito-urinary Instruments and their Care.	Mr. E. W. Riches, M.C., F.R.C.S.
	2 P.M.	Minor Operations : Cadaver Demonstration.	Mr. A. K. Henry, M.B., M.Ch., F.R.C.S.
Wednesday, 29th April	10 A.M.	Self-inflicted Wounds and Suicide.	—
	11 A.M.	Rectal Conditions	Mr. R. H. Franklin, F.R.C.S.
	2 P.M.	Enlarged Glands ; Surface Swellings.	Prof. G. Grey Turner, LL.D., D.Ch., M.S., F.R.C.S., F.R.A.C.S., F.A.C.S.
Thursday, 30th April	10 A.M.	Varicose Veins and their Complications.	Mr. R. H. Franklin, F.R.C.S.
	2 P.M.	Boils, Carbuncles, Cellulitis, General Sepsis.	Mr. G. C. Dorling, F.R.C.S.
Friday, 1st May	10 A.M.	Foot Troubles ; Sprains ..	—
	2 P.M.	Recrudescence of Old Infections, &c., Sinuses.	Prof. G. Grey Turner, LL.D., D.Ch., M.S., F.R.C.S., F.R.A.C.S., F.A.C.S.

The fee for the Course will be one guinea, but no fee will be charged in the case of officers of the Armed Forces who are nominated for the course by their respective Director-Generals. Applications for admission should be addressed to the DEAN, British Postgraduate Medical School, Ducane-road, W.12.

Further War Surgery Courses will commence as follows :—

WAR SURGERY OF THE ABDOMEN .. MONDAY, 11TH MAY, 1942.
WAR MEDICINE .. .. MONDAY, 1ST JUNE, 1942.
TREATMENT OF FRACTURES (limited to 40) MONDAY, 15TH JUNE, 1942.

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For regulations apply REGISTRAR, Apothecaries' Hall, Black Friars-lane, London, E.C.4.

Association of Austrian Doctors in GREAT BRITAIN. Sunday, 19th April, 11 a.m. 69, Eton Avenue, N.W.3 (near Swiss Cottage Station). "PEPTIC ULCER AND GASTRIC SURGERY" Lecture held by Mr. RODNEY MAINGOT, F.R.C.S., author of "Postgraduate Surgery" and "Abdominal Operations." Films will be projected. All English Colleagues are cordially invited."

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At all the branches of the Hospital there are cricket grounds, football and hockey grounds, lawn tennis courts (grass and hard courts), croquet grounds, golf courses, and bowling greens. Ladies and gentlemen have their own gardens, and facilities are provided for handicrafts, such as carpentry, etc.

For terms and further particulars apply to the Medical Superintendent (TELEPHONE: No. 2356 and 2357 Northampton), who can be seen in London by appointment.

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Elizabeth Garrett Anderson Hospital

AND OSTER HOUSE M.S. HOSPITAL.

Applications are invited from registered medical Women for the appointment of Full-time MEDICAL REGISTRAR (B1). Salary £350 or £550, according to seniority. Appointment for one year in first instance. Duties to commence 1st May.

Applications, with two copies of each of three testimonials, to the SECRETARY of the Elizabeth Garrett Anderson Hospital, Euston-road, N.W.1, not later than 20th April.

University of London.

The Senate invite applications for the UNIVERSITY CHAIR OF RADIOLOGY (Therapeutic) tenable at MIDDLESEX HOSPITAL MEDICAL SCHOOL. Salary £1500 a year.

Applications must be received not later than first post on Tuesday, 26th May, 1942, by the ACADEMIC REGISTRAR, University of London, Richmond College, Richmond, Surrey, from whom further particulars should be obtained.

Princess Louise Kensington Hospital

FOR CHILDREN,
St. Quintin-avenue, North Kensington, W.10.

RESIDENT MEDICAL OFFICER (B2) required at end of April. Salary subject to experience, with a minimum of £120 to £200. R practitioners holding A posts may apply when appointment will be limited to six months.

Applications to the SECRETARY.

King Edward Memorial Hospital, Ealing.

CONSULTING ORTHOPÆDIC SURGEON (WAR DEPUTY).

Applications are invited from consultants for the above appointment. Particulars may be obtained from the undersigned, to whom applications should be sent as soon as possible.

Also for the appointment of CASUALTY OFFICER AND HOUSE SURGEON (A), vacant shortly, which includes duties in the Orthopædic and Gynæcological Departments, including R practitioners within three months of qualification. Appointment will be for a period of six months. Salary at the rate of £150 per annum, with full residential emoluments.

Applications, stating age, qualifications with dates, nationality, and accompanied by copies of two recent testimonials, should be sent immediately to—

R. A. MICKELWRIGHT, House Governor.

Dreadnought Seamen's Hospital,

GREENWICH.

Applications are invited from British Male registered medical practitioners for the appointment of HOUSE PHYSICIAN (B2), to become vacant on 1st May, including R practitioners who now hold A posts when appointment will be for a period of six months. Salary is at the rate of £200 per annum, with full residential emoluments.

Applications, stating age, qualifications with dates, and accompanied by copies of three recent testimonials, should be sent immediately to: F. A. LYON, Secretary.

Dreadnought Seamen's Hospital, Greenwich, S.E.10.

Queen Mary's Hospital for the East

END, Stratford, E.15.

Applications are invited from fully qualified and registered medical Men, including R practitioners within three months of qualification, for the following post: HOUSE SURGEON (A post), £200 per annum. The appointment will be for six months, commencing immediately.

Candidates, who must be single, should send applications, together with copies of testimonials, forthwith to—

BERNARD T. HEMPEL, Captain, Chairman.

The Hospital for Women,

Soho-square, W.1.

Applications are invited from qualified Men and Women for appointment as TEMPORARY ANÆSTHETIST. The successful candidate will be required to attend on Wednesday afternoons.

Further particulars, including rate of remuneration, can be obtained from the undersigned to whom applications should be sent by 22nd April. J. P. HEMING, Secretary.

Tilbury Hospital, Tilbury, Essex.

(SEAMEN'S HOSPITAL SOCIETY.) (116 Beds.)

Applications are invited from British Male registered practitioners for the appointment of HOUSE OFFICER (A), falling vacant on 1st May, 1942, including R practitioners within three months of qualification when appointment will be for six months. Salary at the rate of £120 per annum, with full residential emoluments.

Applications, stating age, qualifications with dates, and testimonials, to be sent immediately to: F. A. LYON, Secretary. Seamen's Hospital Society, Greenwich, S.E.10.

Ministry of Labour and National SERVICE.

APPOINTMENT OF ONE OR MORE TEMPORARY MEDICAL INSPECTORS OF FACTORIES.

Applications are invited for the above appointments from registered medical practitioners who, in the case of Males, must be above the current registration age under the National Service (Armed Forces) Act or ineligible for service in H.M. Forces. Salary at a fixed rate of £750 per annum. Successful applicants will be required to reside in such places in Great Britain as the Minister may from time to time direct.

Further information, together with a form of application, can be obtained on request, preferably by postcard, from the Factory and Welfare Department (Room 6), 28, Broadway, Westminster, S.W.1.

The Hospital for Sick Children,
Great Ormond-street, London, W.C.1.

Vacancies for Two HOUSE PHYSICIANS (B2) and Two HOUSE SURGEONS (B2) will occur on the 1st July, 1942. Applications are invited from registered medical practitioners, Male and Female, including R practitioners who hold A posts. The appointments are for six months. Salaries at the rate of £200 per annum, with full residential emoluments.

Further particulars and form of application, which must be returned not later than the 25th May, 1942, are obtainable from: HERBERT F. RUTHERFORD, Secretary.

April, 1942.

Royal National Orthopædic Hospital,
234, Great Portland-street, W.1.

Applications are invited from registered medical practitioners, including R practitioners holding A posts, for the appointment of RESIDENT HOUSE SURGEON (B2) to commence 1st May. The appointment is for six months. Salary £200 per annum, with board, quarters, laundry, &c.

Applications, stating age, nationality, qualifications, and previous experience, with copies of testimonials, should be sent to the SECRETARY not later than 15th April.

Hôpital et Dispensaire Français,
172, Shaftesbury-avenue, W.C.2.

Applications are invited for the post of ANÆSTHETIST to the above Hospital. Honorarium £25 per annum. Candidates should have a working knowledge of French and must be engaged solely in the practice of anæsthetics.

Copies of three recent testimonials to be sent to the SECRETARY on or before the 30th April, 1942.

Enfield Education Committee.

Applications are invited from unmarried Women for the appointment of ASSISTANT SCHOOL MEDICAL OFFICER, at a salary of £600 per annum, rising by annual increments of £25 to £725 per annum (with car allowance of £60 per annum). Preference will be given to applicants holding a Diploma in Public Health. The officer appointed will be required to reside in the district. In addition to duties as Assistant School Medical Officer, the officer appointed may be required to carry out duties in connexion with maternity and child welfare and A.R.P., and such other duties as may be assigned by the Education Committee or the School Medical Officer.

The appointment will be full time and subject to the provisions of the Local Government Superannuation Act, 1937, including medical examination by the Medical Officer of Health, and to such of the conditions of employment of the Education Committee as may apply. The officer appointed will be entitled to one month's annual holiday, subject to the exigencies of the service.

Forms of application, which can be obtained from me, should be returned with copies of three recent testimonials by the first post on 21st April, 1942.

E. PASCAL, Director of Education.

Education Offices, Silver-street, Enfield, Middlesex.

County of Warwick.
WARWICK HOSPITAL.

Applications are invited from registered medical practitioners (Male and Female) for the appointment of HOUSE SURGEON (A), at the above Hospital, including practitioners who have registered under the National Service (Armed Forces) Act, 1939, but who are within three months of qualification. The appointment will be limited in the first place to six months. Salary £150 per annum, with full residential emoluments.

Applications on forms to be obtained from the Public Assistance Officer, Shire Hall, Warwick, should, on completion, be returned to him together with copies of three recent testimonials.

L. EDGAR STEPHENS, Clerk of the Council.

2nd April, 1942.

Surrey County Council.

Applications are invited from registered medical practitioners (Male) who are ineligible for service with H.M. Forces, for the post of DEPUTY MEDICAL SUPERINTENDENT in the Surrey County Mental Hospital Service. The appointment is temporary, and will, subject to satisfactory service, continue for the further duration of the War.

Scale of salary £720, rising by annual increments of £25 to a maximum of £820 per annum. In fixing the commencing salary regard will be had to the experience and attainments of the person appointed. An unfurnished house is available on the Hospital Estate, and there are no other emoluments attached to the post. In the case of a single man, board and lodging may be provided in the Hospital, in which case an appropriate adjustment of the cash salary will be made.

Candidates should preferably hold the Diploma in Psychological Medicine, or equivalent degree.

The person appointed will be required to undergo a medical examination.

Applications, stating age, and whether married or single, accompanied by copies of three recent testimonials, must reach the undersigned not later than Saturday, the 25th April, 1942. The envelope should be marked "Deputy Medical Superintendent."

DUDLEY AUKLAND, Clerk of the Council.

Mental Hospitals Department, County Hall, Kingston-upon-Thames, 14th April, 1942.

Keighley County Hospital,
KEIGHLEY, YORKS.

Applications are invited from registered medical practitioners including R practitioners who now hold A posts, for the appointment of RESIDENT MEDICAL OFFICER (B2). The appointment to R practitioners will be limited to six months' otherwise it will be for a period of six months and renewable thereafter for a further six months. Salary is at the rate of £200 per annum, plus board and lodging valued at £100 per annum.

Applications, stating age, qualifications with dates, nationality and present position, and accompanied by copies of not more than three recent testimonials, should be sent to the CLERK OF THE COUNTY COUNCIL, County Hall, Wakefield, by not later than the 25th April, 1942.

Royal Sheffield Infirmary and Hospital.

Applications are invited from registered medical practitioners, Male and Female, including R practitioners within three months of qualification, for Two posts now vacant of ASSISTANT CASUALTY OFFICERS (A). The appointment to R practitioners will be for a period of six months. Salary is at the rate of £80 per annum, plus bonus, with full residential emoluments.

Applications, stating age, qualifications with dates and nationality, and accompanied by copies of three recent testimonials, should be sent at once to THE SUPERINTENDENT, ROYAL HOSPITAL, SHEFFIELD.

Worcestershire County Council.
ALL SAINTS' HOSPITAL, BROMSGROVE.

APPOINTMENT OF RESIDENT MEDICAL OFFICER (B1.)

Applications are invited from registered medical practitioners, Male or Female, for the above appointment. The duties of the person appointed will be to take charge of certain medical wards, and also to assist in the work of a Neurosis Unit. The appointment will be terminable by either party giving the other one month's notice in writing. Suitably qualified R practitioners holding B2 or B1 posts may apply. Salary will be at the rate of £350 per annum, with full residential emoluments.

Applications, stating age, nationality, qualifications with dates and experience, accompanied by copies of not more than three testimonials, should be sent to the MEDICAL SUPERINTENDENT, All Saints' Hospital, Bromsgrove, not later than the 26th April, 1942. (W.75.)

Worcestershire County Council.
ALL SAINTS' HOSPITAL, BROMSGROVE.

Applications are invited from registered medical practitioners, Male or Female, for the appointment of HOUSE SURGEON (A), including R practitioners within three months of qualification.

The appointment to R practitioners will be for a period of 6 months. The duties of the person appointed will be to act as House Surgeon to the surgical wards, which include a special Neuro-Surgical Unit. The salary will be at the rate of £120 per annum, with full residential emoluments.

Applications, stating age, nationality, qualifications with dates and experience, accompanied by copies of not more than three testimonials, should be sent to the MEDICAL SUPERINTENDENT, All Saints' Hospital, Bromsgrove, not later than the 25th April, 1942. (W.74.)

City of Birmingham Maternity and
CHILD WELFARE DEPARTMENT.

The Public Health Committee invite applications from qualified medical Women to act as MEDICAL OFFICER in the above department. Applicants should have had a six months' resident appointment in a children's hospital and in a maternity hospital. The D.P.H. will be considered an additional qualification. The salary scale is £500, rising by £25 annually to £700 per annum, plus bonus; the commencing salary within that scale depends on the medical officer's experience. A car allowance is made. The appointment will be subject to membership of the Birmingham Corporation's Superannuation Scheme, and to the candidate passing a medical examination, and will be subject to three months' notice on either side.

Applications, endorsed "Medical Officer for Maternity and Child Welfare," and accompanied by copies of three testimonials, to be made on a form obtainable from the MEDICAL OFFICER OF HEALTH, Council House, Birmingham, 3, and returned to him on or before April 18th, 1942.

Addenbrooke's Hospital, Cambridge.

Applications are invited from qualified Men and Women not eligible for military service and of specialist status for the full-time non-resident post of ASSISTANT to the GYNÆCOLOGICAL DEPARTMENT. The salary will be at the rate of £450 to £500, according to qualifications. Particulars of the post will be supplied on request.

Applications, giving age, qualifications, and particulars of experience, together with copies of testimonials, should be sent on or before 15th April, 1942, to—

J. A. BEARDSALL, Secretary-Superintendent.

County Council of Durham.

Applications are invited for the post of TEMPORARY ASSISTANT MEDICAL OFFICER OF HEALTH (Male) at a salary of £600 per annum, plus cost-of-living bonus.

Applicants must be registered medical practitioners, and the possession of a qualification in Public Health will be an additional recommendation.

The officer appointed will work under the direction of the County Medical Officer of Health and will be required to devote the whole of his time to the duties of the office, which will include medical work associated with the County Council's Air Raid Precautions Scheme.

The appointment is subject to one calendar month's notice on either side, to the regulations for the time being of the County Council relative to the payment of salary in case of sickness, and to the provisions of the Local Government Superannuation Act, 1937. The successful candidate will be required to pass a medical examination.

Travelling and subsistence allowances will be paid by the County Council in accordance with a scale to be approved from time to time.

Applications, stating age, qualifications and experience, and accompanied by copies of not more than three recent testimonials, should be forwarded to the County Medical Officer of Health, Shire Hall, Durham, not later than first post on Saturday, 25th April, 1942.

J. K. HOPE, Clerk of the County Council.

Shire Hall, Durham, 2nd April, 1942.

County Borough of Walsall.

MANOR HOSPITAL. (330 Beds.)

APPOINTMENT OF EAR, NOSE AND THROAT SURGEON.

The Health Committee invite applications for the above appointment from gentlemen of recognised Consultant rank to conduct a Combined Consultative and Operative Clinic at the Manor Hospital once weekly. Salary £200 per annum.

Applications to be sent to—

JAMES A. M. CLARK, Medical Officer of Health.

Health Department, Council House, Walsall, 6th April, 1942.

Pembroke County War Memorial HOSPITAL, HAVERFORDWEST.

(Total 182 Beds.)

Applications are invited from registered medical practitioners for the appointment of a HOUSE SURGEON (A) to become vacant on May 1st. R practitioners within three months of qualification may apply when appointment will be for a period of six months. Salary is at the rate of £200 per annum, with full residential emoluments.

Applications, stating age, qualifications, with dates and nationality, and accompanied by three testimonials should be sent to—

B. GLANVILLE DAVIES, Secretary.

Hampshire County Council.

COUNTY COUNCIL HOSPITAL, ALTON.

Applications are invited from medical practitioners, Male or Female, for post of RESIDENT HOUSE OFFICER (A post) at £150 per annum. R practitioners within three months of qualification may apply when appointment will be for period of six months.

Applications, stating age, qualifications with dates and nationality, and accompanied by copies of three testimonials, to be sent to—

H. LESLIE CRONK, County Medical Officer.

The Castle, Winchester.

East Suffolk and Ipswich Hospital, IPSWICH (400 Beds.)

Applications are invited from registered medical practitioners for the appointment of RESIDENT SURGICAL OFFICER (B1) to this Hospital and MEDICAL SUPERINTENDENT to the branch hospital (50 Beds). Applicants should have held house appointments and had surgical experience. Preference will be given to candidates holding Diploma of F.R.C.S. Suitably qualified R practitioners holding B2 or B1 appointments are invited to apply. Salary £500.

Applications stating age, nationality, qualifications with dates, experience, and details of previous appointments, and accompanied by copies of three recent testimonials, should be sent to— ARTHUR GRIFFITHS, Secretary.

The Hospital, Ipswich, 11th April, 1942.

Llanelly and District General HOSPITAL, (148 Beds plus 100 Beds, ANNEXE)

Applications are invited from registered medical practitioners, Male or Female, for the appointment of SENIOR HOUSE-SURGEON AND ANÆSTHETIST (B2) including R practitioners who now hold A posts.

To R practitioners the appointment will be limited to six months. Salary according to experience and qualifications, with minimum of £200 per annum.

Applications, stating age, qualifications with dates, nationality and present post, accompanied by copies of three recent testimonials, should be sent immediately to—

T. E. PIPE, Secretary.

Coventry and Warwickshire Hospital.

APPOINTMENT OF CASUALTY OFFICER (B2), HOUSE SURGEON (B2), AND HOUSE SURGEON (A).

Applications are invited from registered medical practitioners, Male and Female, for the above appointments, including, in the case of the B2 appointments, R practitioners who now hold A posts, and including R practitioners within three months of qualification for the A post. To R practitioners the appointments will be limited to six months. Salary at the rate of £150 per annum, plus £20 cost-of-living bonus, and full residential emoluments. The appointed candidates will be expected to take up duties on the 1st May, 1942.

Applications for the above posts, stating age, nationality, qualifications with dates, experience and details of previous appointments, and accompanied by copies of not more than three recent testimonials, should be addressed to the HOUSE GOVERNOR AND SECRETARY, Coventry and Warwickshire Hospital, Coventry.

City and County of Newcastle upon TYNE.

NEWCASTLE GENERAL HOSPITAL (900 Beds).

APPOINTMENT OF HOUSE PHYSICIANS (A) AND HOUSE SURGEONS (A).

Applications are invited from registered medical practitioners for the above appointments, including R practitioners within three months of qualification. The appointments will be tenable for a period of six months. Salary £150 per annum, together with the usual residential emoluments.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of two recent testimonials, should be forwarded immediately to the MEDICAL OFFICER OF HEALTH, Health Department, Town Hall, Newcastle upon Tyne, 1.

East Fortune Sanatorium Unit (220 Beds)

BANGOUR HOSPITAL, BROXBURN, WEST LOTHIAN.

ASSISTANT MEDICAL OFFICER (B1 post), Male or Female, required to take up duty at an early date. The Sanatorium deals with all forms of tuberculosis and this is the only assistant post. Salary £350, with board, lodging and laundry. Superannuation. Suitably qualified R practitioners holding B2 or B1 posts may apply, but must have obtained the prior sanction of the Scottish Central Medical War Committee.

Applications, with three copies each of three recent testimonials, should be sent on or before 22nd April, to the subscriber.

G. J. MCGREGOR, Secretary.

County Rooms, Geo. IV Bridge, Edinburgh.

Northampton General Hospital.

(405 Beds.)

Applications are invited immediately from registered medical practitioners, including R practitioners within three months of qualification when appointment will be for a period of six months, for the appointment of HOUSE SURGEON (A). In addition to general surgery, this post carries with it good experience in Fracture work. Salary at the rate of £150 per annum, with board, residence and laundry.

Applications, stating age, qualifications with dates, nationality, and accompanied by copies of three recent testimonials, should be sent as soon as possible to—

GORDON S. STURTRIDGE, M.B., B.S., Superintendent.

4th April, 1942.

City of Leicester.

CITY GENERAL HOSPITAL.

APPOINTMENT OF RESIDENT OBSTETRICIAN AND GYNÆCOLOGIST (B1) (TEMPORARY).

Applications are invited for the above appointment. Applicants must hold a high qualification in obstetrics and gynæcology and also, preferably, the F.R.C.S. (or equivalent), as the holder of the appointment may be required to carry out major surgery. The commencing salary is £600, with full residential emoluments, valued at £150 per annum. The appointment will be considered to be on a temporary basis for the duration of the war, at the end of which time it will be reviewed. There are 61 beds in the department and just over 1000 confinements a year. Suitably qualified R practitioners holding B2 or B1 posts may apply.

Applications, accompanied by three recent testimonials, must be sent in before the 18th April, 1942, to the undersigned, from whom fuller details of the appointment can be obtained.

E. K. MACDONALD, Medical Officer of Health.

Health Department, Grey Friars, Leicester, March, 1942.

City of Leicester.

CITY GENERAL HOSPITAL.

Applications are invited from registered medical practitioners, including R practitioners within three months of qualification, for the appointment of a JUNIOR RESIDENT MEDICAL OFFICER (A), mainly for surgical duties. The appointment to R practitioners will be limited to six months, otherwise it will be for a period of six months and renewable for a further six months. Salary is at the rate of £200 per annum, with full residential emoluments.

Applications, stating age, nationality, qualifications and experience, with dates, and accompanied by copies of three recent testimonials, should be sent at once to—

E. K. MACDONALD, Medical Officer of Health.

Health Department, Grey Friars, Leicester, April, 1942.

The King Edward VII Welsh National MEMORIAL ASSOCIATION.

Applications are invited from registered medical practitioners, Male and Female, for the following appointment, including R practitioners who now hold A posts when appointment will be limited to six months: JUNIOR ASSISTANT RESIDENT MEDICAL OFFICER (B2) at the NORTH WALES SANATORIUM, Denbigh (247 Beds for pulmonary female patients, and surgical tuberculosis in men, women, and children, exclusive of Government pavilions—96 Beds at present in commission—for the treatment of Service cases suffering from tuberculosis). The salary is at the rate of £200 per annum, with full residential emoluments.

Applications, stating age, qualifications with dates, nationality, and present post, and accompanied by copies of three recent testimonials, should be sent not later than Wednesday 15th April, 1942, to: D. A. POWELL, Principal Medical Officer., Memorial Offices, Cathays Park, Cardiff, 30th March, 1942.

The Warwickshire and Coventry JOINT COMMITTEE FOR TUBERCULOSIS.

KING EDWARD VII MEMORIAL SANATORIUM, HERTFORD HILL, Near WARWICK.

Applications are invited from registered medical Women practitioners for the appointment of JUNIOR ASSISTANT MEDICAL OFFICER (A) at the above Sanatorium. The appointment will be for six months and may be renewed for a further period of six months. The salary is at the rate of £300 per annum, with full residential emoluments.

Applications, stating age, qualifications with dates, nationality, and present post, and accompanied by copies of three recent testimonials, should be sent to the Medical Superintendent, King Edward VII Memorial Sanatorium, Hertford Hill, near Warwick, not later than 23rd April, 1942.

L. EDGAR STEPHENS, Clerk to the Joint Committee.

Shire Hall, Warwick, 27th March, 1942.

The Chester Royal Infirmary.

(Normal Capacity 225 Beds.)

Applications are invited from registered medical practitioners for the appointment of a NON-RESIDENT ORTHOPÆDIC REGISTRAR (B1) to take up duty on 13th May, 1942. Applicants should have held house appointments and had experience in Orthopædics. Preference will be given to candidates holding diploma of F.R.C.S. Suitably qualified R practitioners holding B2 or B1 appointments are invited to apply. Salary is at the rate of £350 per annum, with lunch and tea and certain other professional emoluments.

Applications, stating age, nationality, qualifications with dates, experience, and details of previous appointments, and accompanied by copies of three recent testimonials, should be sent to the undersigned not later than the 18th April, from whom a copy of the Rules of the appointment may be obtained.

W. H. GRACE, Hon. Secretary, Medical Committee.

Beckett Hospital, Barnsley.

Applications are invited from registered medical practitioners for the appointment of RESIDENT SURGICAL OFFICER (B1), to become vacant on 1st May. Applicants should have held house appointments and had surgical experience. Suitably qualified R practitioners holding B2 or B1 appointments may apply. Preference will be given to candidates holding diploma of F.R.C.S. Salary is at the rate of £350 per annum.

Applications, stating age, nationality, qualifications with dates, experience, and details of previous appointments, and accompanied by copies of three recent testimonials, should be sent as soon as possible to—

ARTHUR L. BOURNE, Secretary-Superintendent.

31st March, 1942.

County Borough of Rochdale.

MUNICIPAL GENERAL HOSPITAL—BIRCH HILL. (475 Beds.)

Applications are invited from registered medical practitioners (Male) for the post of JUNIOR RESIDENT MEDICAL OFFICER (A), including R practitioners within three months of qualification when appointment will be for a period of six months, and in any case will only be renewable for a further period of six months. The Hospital provides accommodation for medical, surgical, maternity cases and children, and the appointment includes certain services at the adjoining Public Assistance Institution. Salary at the rate of £225 per annum, plus war bonus of approximately £16 per annum, with full residential emoluments.

Application forms may be obtained from the Medical Officer of Health, Public Health Offices, Baillie-street, Rochdale, and must be returned to him not later than Saturday, the 25th April, 1942.

HARRY BANN, Town Clerk.

Royal Victoria Hospital, Belfast.

RESIDENT MEDICAL OFFICER WANTED FOR GYNÆCOLOGICAL WARDS (52 Beds).

The appointment is for six months, and applicants must have held a resident appointment for at least six months. Salary £100 per annum.

Applications, with not less than three testimonials, to be forwarded to the Superintendent immediately.

J. S. ROGERS, Honorary Secretary.

Surrey County Council.

PUBLIC HEALTH DEPARTMENT.

Applications are invited for the temporary position of RESIDENT PHYSICIAN AND ACTING DEPUTY MEDICAL SUPERINTENDENT (B1) at REDHILL COUNTY HOSPITAL (400 Beds). Suitably qualified R practitioners holding B2 or B1 appointments may apply. The salary scale is £600 per annum, rising by £25 annually to £700, plus full residential emoluments valued at £125, and an additional £50 per annum for administrative duties whilst acting as Deputy Medical Superintendent. Preference will be given to holders of a higher medical qualification. The post is temporary for the duration of the war and is terminable by one month's notice on either side.

Applications, stating age and experience, and enclosing copies of testimonials, should be sent to the County Medical Officer, County Hall, Kingston-on-Thames, by the 22nd April, 1942.

DUDLEY AUKLAND, Clerk of the Council.

County Hall, Kingston-on-Thames, 2nd April, 1942.

Rural District Council of Dartford.

The Council invite applications for the appointment of a Part-time MEDICAL OFFICER at a salary of £250 per annum. The successful candidate will be under the general direction of the Medical Officer of Health, but the duties will be mainly in connexion with the Council's Maternity and Child Welfare work and he may also be asked to take charge of a mobile unit.

Applications, on forms to be obtained from the undersigned, should reach me not later than the 14th April, 1942, endorsed "Medical Officer." ERNEST JAMES, Clerk to the Council.

Council Offices, West Hill, Dartford, 30th March, 1942.

The Southampton Children's Hospital AND DISPENSARY FOR WOMEN.

Applications are invited from registered medical practitioners, Female, for the appointment of a RESIDENT MEDICAL OFFICER (A), now vacant. Salary is at the rate of £150 per annum, with full residential emoluments.

Applications, stating age, qualifications with dates, and nationality, and accompanied by three recent testimonials, should be sent immediately to: ELLA K. MATTHEWS, Secretary.

Preston and County of Lancaster ROYAL INFIRMARY.

Applications are invited from registered medical practitioners, Male and Female, for the post of RESIDENT ANÆSTHETIST (B2), to become vacant on 31st May, 1942, including R practitioners who now hold A posts when appointment will be limited to six months. Preference will be given to candidates who hold the Diploma in Anæsthetics. Salary will be at the rate of £300 per annum, with the usual residential emoluments, for a practitioner holding the Diploma in Anæsthetics.

Applications, stating age, qualifications with dates, nationality, and present posts, and accompanied by copies of three recent testimonials, should be sent to—

JOHN GIBSON, Superintendent and Secretary.

Royal Infirmary, Preston.

Royal Sussex County Hospital, BRIGHTON.

Applications are invited from registered medical practitioners (Male) for the appointment of a HOUSE SURGEON (A), vacant early in May. R practitioners within three months of qualification may apply when appointment will be for a period of six months; otherwise it will be for a period of at least six months. Salary is at the rate of £150 per annum, with full residential emoluments.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of three recent testimonials, should be sent as soon as possible to—

L. L. W. LANCASTER-GAYE, Secretary-Superintendent.

The Bolton Royal Infirmary.

(242 Beds.)

Applications are invited from registered medical practitioners, Male, for the appointment of HOUSE SURGEON (A), including R practitioners within three months of qualification. Appointment is for a period of six months. Salary £150 per annum, with full residential emoluments.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of three recent testimonials, should be sent immediately to—

H. CORLESS, Deputy Superintendent-Secretary.

Herefordshire General Hospital, HEREFORD. (210 Beds.)

Applications are invited from registered medical practitioners (Male), including R practitioners within three months of qualification, for the appointment of JUNIOR HOUSE SURGEON (A), including House Surgeon to Ear, Nose, and Throat Department. The appointment will be limited to six months. Salary is at the rate of £150 per annum, with full residential emoluments.

Applications, stating age, qualifications, and nationality, and accompanied by copies of three recent testimonials, should be sent to: T. W. UPTON, Secretary.

Lancashire County Council.

COUNTY HOSPITAL, WHISTON, Near PRESCOT.

APPOINTMENT OF A RESIDENT SURGICAL OFFICER (B1).

Applications are invited from registered medical practitioners for the above appointment. Applicants should have held house appointments and had surgical experience. Preference will be given to candidates holding Diploma of F.R.C.S. Suitably qualified R practitioners holding B2 or B1 appointments are invited to apply. The Hospital is a General Hospital dealing with acute work and comprises 800 Beds. Salary is at the rate of £550 per annum, together with the usual residential emoluments. The person appointed will be required to take up duty as early as possible.

Forms of application may be obtained from the County Medical Officer of Health, Hospital and Medical Department, County Offices, Preston, to whom all applications must be returned not later than Monday, the 20th April, 1942.

GEORGE ETHERTON, Clerk of the County Council.

County Offices, Preston, 28th March, 1942.

Surrey County Council.

PUBLIC HEALTH DEPARTMENT.

ST. HELIER COUNTY HOSPITAL, CARSHALTON.
(An acute general hospital of 862 Beds which is nearing completion, and the first half of which is already in operation.)

Applications are invited from Women or Men practitioners for the temporary appointment of MEDICAL OFFICER (B1) for general medical duties, plus administration of anæsthetics. Preference will be given to candidates with wide experience as an anæsthetist, as the duties of the post are largely of this nature. R practitioners holding B2 or B1 posts may apply. The position will be available for the duration of the war.

The salary is £550 per annum, plus full residential emoluments.

Applications, stating age and experience, and enclosing copies of three testimonials, should be sent to the Medical Superintendent of the Hospital so as to be received not later than 17th April, 1942.

DUDLEY AUKLAND, Clerk of the Council.

County Hall, Kingston-upon-Thames, 24th March, 1942.

Royal Isle of Wight County Hospital, RYDE.

Applications are invited from registered medical practitioners (Female) for the appointment of a HOUSE SURGEON (B2), to become vacant on 1st May next. The appointment will be for six months. Salary at the rate of £180 a year, with board, residence, and laundry. As this is the senior post, previous surgical experience is advisable.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of three recent testimonials, should be sent as soon as possible to—

A. S. GORDON, Secretary.

Ancoats Hospital, Manchester, 4.

APPOINTMENT OF ORTHOPÆDIC HOUSE SURGEON (A).

Applications are invited from medical practitioners (Male or Female) for the above post, to become vacant on May 1st. The appointment is for six months. Salary £100 per annum plus 15 per cent. bonus, with board, residence, &c.

Applications, stating age, qualification with dates, and nationality, accompanied by copies of three recent testimonials, should be sent on or before 15th April.

HERBERT J. DAFFORNE,
General Superintendent and Secretary.

Royal Cornwall Infirmary, Truro.

(285 Beds—4 Residents.)

Applications are invited from registered medical practitioners, Male and Female, for the appointment of a HOUSE SURGEON (B2), in charge of the ORTHOPÆDIC, FRACTURE, AND CASUALTY DEPARTMENT (which will become vacant on 19th April). R practitioners who now hold A posts may apply when appointment will be limited to six months. The salary is at the rate of £200 per annum, with full residential emoluments.

Applications, stating age, qualifications with dates, nationality, and present post, and accompanied by copies of three recent testimonials, should be sent to—

W. E. GRENFELL, Hon. Secretary.

Truro, 24th March, 1942.

Bucks County Council.

Applications are invited for the post of whole-time ASSISTANT MEDICAL OFFICER at a salary of £600, rising by annual increments of £25 to a maximum of £700, with travelling and subsistence allowances on the county scale. The successful candidate will be required to pass a medical examination. The appointment will be subject to the Local Government Superannuation Act, 1937, but will, for the duration of the war, be a temporary one to fill a permanent post, and the successful applicant will be considered for the permanent appointment in due course.

The duties will be mainly in connexion with maternity and child welfare and school medical services. Experience in tuberculosis an advantage. Possession of a Diploma in Public Health or its equivalent is essential.

Forms of application and particulars of duties may be obtained from the undersigned, and after completion must be returned to the COUNTY MEDICAL OFFICER, COUNTY OFFICES, AYLESBURY, together with copies of not more than three recent testimonials, by Thursday, 16th April, 1942.

GUY R. CROUCH, Clerk of the Bucks County Council.

County Hall, Aylesbury, 27th March, 1942.

Oldham Royal Infirmary.

(186 Beds.)

APPOINTMENT OF CASUALTY OFFICER AND ORTHOPÆDIC HOUSE SURGEON (B2).
REQUIRED IMMEDIATELY.

Applications are invited from registered medical practitioners, Male and Female, for the above appointment, to take charge of the Casualty Department, and to work under the Orthopædic Surgeon. At the Fracture Clinic there is an average attendance of 150–170 cases per week. Applicants may include R practitioners who hold A posts. Appointment will be for six months. Salary is at the rate of £200 per annum, with full residential emoluments.

Applications, stating age, qualifications with dates, nationality, and present post, and accompanied by copies of three recent testimonials, should be forwarded not later than Tuesday, the 14th April, to—

F. W. BARNETT, General Superintendent and Secretary.

Lincoln County Hospital.

APPOINTMENT OF SENIOR HOUSE SURGEON (B1) (LOCUM TENENS).

Applications are invited from registered medical practitioners for the above appointment, from 1st June to 30th September, 1942.

Applicants should have held house appointments and had surgical experience. Suitably qualified R practitioners holding B1 or B2 appointments are invited to apply. Salary is at the rate of £7 7s. per week, with full residential emoluments.

Applications, stating age, nationality, qualifications with dates, experience, and details of previous appointments, and accompanied by copies of three recent testimonials, should be sent to: ARTHUR MOORE, Secretary-Superintendent.

Lincoln, 21st March, 1942.

Huntingdonshire County Council.

PUBLIC HEALTH DEPARTMENT.

Applications are invited from registered medical practitioners (Female) for the post of HOUSE SURGEON at PAXTON PARK EMERGENCY MATERNITY HOME in the County of Huntingdon. Candidates must have had previous midwifery experience. The salary will be at the rate of £200 per annum, with full board, lodging, and laundry.

Applications, stating age, nationality, qualifications, and experience, and accompanied by copies of not more than two recent testimonials, should be sent at once to—

C. B. MOSS-BLUNDELL, County Medical Officer.

County Offices, Gazeley House, Huntingdon.

Hull Royal Infirmary.

Applications are invited from registered medical practitioners for the post of CASUALTY OFFICER (A), vacant May. R practitioners within three months of qualification may apply, when appointment will be limited to six months. Salary at the rate of £175 (plus £25 war bonus) per annum, with full residential emoluments.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of recent testimonials, should be sent to: R. J. CARLESS, House Governor.

ESTABLISHED 1885

The Medical Defence Union

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Annual Subscription £1 MEMBERSHIP EXCEEDS 24,500 Assets exceed £100,000

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22

PUBLISHED by the PROPRIETORS, THE LANCET LIMITED, 7, Adam Street, Adelphi, in the County of London.
Editorial Office Address, 26, Temple Street, Aylesbury, Bucks (Aylesbury 315).
Printed by HAZELL, WATSON & VINEY, LTD., London and Aylesbury—Saturday, April 11, 1942.
PRINTED IN GREAT BRITAIN—Entered as Second Class at the New York, U.S.A., Office.

Essex County Council.

PUBLIC HEALTH DEPARTMENT.

Applications are invited from registered medical practitioners possessing experience of administrative work for the post of ASSISTANT MEDICAL OFFICER on the Central Staff of the Council's Public Health Department.

The duties of the officer will be chiefly to assist in the administration of hospitals, sanatoria, public assistance establishments, and the tuberculosis services of the Council.

The salary attaching to the post will be at the rate of £650 a year, rising, subject to satisfactory conduct and service, by annual increments of £25 to £700 a year, but the commencing salary may be varied, having regard to the experience and capabilities of the candidate appointed.

Forms of application may be obtained from the undersigned, to whom they should be returned completed, accompanied by copies of three recent testimonials, and in envelopes endorsed "Assistant Medical Officer," not later than 27th April, 1942.

Canvassing, whether directly or indirectly, is forbidden.

JOHN E. LIGHTBURN, Clerk of the County Council.

County Hall, Chelmsford, 30th March, 1942.

Essex County Council Hospital,

BROOMFIELD.

Applications are invited from registered medical practitioners for the appointment of SECOND ASSISTANT MEDICAL OFFICER (B1) at the Essex County Council Hospital, Broomfield, which contains 300 Beds for the treatment of male patients suffering from pulmonary or surgical tuberculosis.

Applicants should have held house appointments and have had experience in the treatment of tuberculosis. Suitably qualified R practitioners holding B2 or B1 appointments are invited to apply. The appointment will be limited to four years. Salary £350, rising, subject to satisfactory service, by annual increments of £25 to £425 per annum, together with the usual indoor emoluments, valued at £160 per annum.

Applications on the prescribed form, obtainable from the undersigned, should be addressed to me, in an envelope marked "Appointment of Second Assistant Medical Officer," and delivered at the County Hall, Chelmsford, not later than 9 A.M. on Monday, the 20th day of April, 1942.

JOHN E. LIGHTBURN, Clerk of the County Council.

County Hall, Chelmsford, 23rd March, 1942.

Cardiff Royal Infirmary.

Applications are invited from registered medical practitioners Male or Female, for the appointment of SENIOR RESIDENT ANÆSTHETIST (B2), which became vacant on the 30th March, 1942. R practitioners holding A posts may apply when the appointment will be limited to six months; otherwise it will be subject to renewal. The salary will be at the rate of £100 per annum for the first six months and £150 per annum for the second six months, if reappointed.

Applications, stating age, qualifications with dates, nationality, and present post, and accompanied by copies of three recent testimonials, should be sent to the undersigned immediately.

Application forms may be obtained from—

R. ARMSTRONG, Medical Superintendent.

Montagu Hospital, Mexborough.

(120 Beds.)

Applications are invited from registered medical practitioners (Male) for the appointment of RESIDENT CASUALTY OFFICER (B2). R practitioners who now hold A posts may apply when appointment will be limited to six months; otherwise it will be for a period of twelve months. The salary is at the rate of £250 per annum, with full residential emoluments.

Applications, stating age, qualifications with dates, nationality, and present post, and accompanied by copies of three recent testimonials, should be sent immediately to—

A. LAYCOCK, Secretary-Superintendent.

Royal Albert Edward Infirmary

AND DISPENSARY, WIGAN. (Normally 189 Beds.)

Applications are invited from registered medical practitioners (Male) for the appointment of a HOUSE SURGEON (A), now vacant. R practitioners within three months of qualification may apply, when appointment will be for a period of six months. Salary is at the rate of £150 per annum, with full residential emoluments.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of three recent testimonials, should be sent as soon as possible to—

A. STANLEY BRUNT, General Superintendent and Secretary.

2nd March, 1942.

Salford Royal Hospital.

(256 Beds.)

Applications are invited from registered medical practitioners, Male and Female, including R practitioners within three months of qualification, for the following vacancy: HOUSE SURGEON (A). Salary at the rate of £125 per annum, with full residential emoluments. The appointment is normally for six months.

Applications, on the prescribed form, should be sent at once to the undersigned, from whom further particulars and form of application are obtainable.

H. B. SHELSWELL, General Superintendent and Secretary.

Birmingham and Midland Eye Hospital,

CHURCH-STREET, BIRMINGHAM, 3.

Applications are invited from registered medical practitioners for the post of RESIDENT SURGICAL OFFICER (B1) now vacant. Suitably qualified R practitioners, holding B1 or B2 appointments are invited to apply. Salary at the rate of £200 per annum plus £10 laundry allowance.

Also Male or Female practitioners for the post of HOUSE SURGEON (B2) now vacant. R practitioners within three months of qualification, when appointment will be for a period of six months. Salary at the rate of £130 per annum for the first six months, rising to £150 per annum thereafter, in each case with £10 laundry allowance.

Applications, stating age, qualifications with dates, experience, details of previous appointments, nationality, and accompanied by copies of three recent testimonials, should be sent to the HOUSE GOVERNOR.

County Borough of Blackburn.

LADY ASSISTANT MEDICAL OFFICER OF HEALTH AND ASSISTANT SCHOOL MEDICAL OFFICER.

Applications are invited from registered Women practitioners for the above appointment to act under the direction and supervision of the Medical Officer of Health, who is also School Medical Officer. Salary £600 per annum, rising by annual increments of £25 to £700 per annum, plus war bonus.

In fixing the commencing salary within the scale, regard will be had to previous recognised service. Applicants should have had at least three years' post-graduate experience in the practice of their profession and special experience of practical midwifery and antenatal work.

Preference will be given to candidates who hold a registrable degree or diploma in Public Health.

Application forms, obtainable from the Medical Officer of Health, Victoria-street, Blackburn, should be returned to him not later than the 16th of April, 1942, endorsed "Assistant Medical Officer of Health."

CHAS. S. ROBINSON, Town Clerk.

Manchester Royal Eye Hospital.

Applications are invited from registered medical practitioners, Male and Female, for the appointment of a HOUSE SURGEON (A), now vacant. R practitioners within three months of qualification may apply when appointment will be held for a period of six months. Salary is at the rate of £120 per annum, with full residential emoluments.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of three recent testimonials, should be sent to—

H. R. NORTH, General Superintendent and Secretary.

Wanted, Locum for duration. East

End Practice.—Address, No. 862, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

Applications are invited from fully

qualified medical practitioners, over military age, preferably with either industrial experience or with D.P.H. degree, for full-time appointment as MEDICAL OFFICER to a large industrial concern, engaged upon essential war work, with factories in the Greater London area. Salary £650–£800 per annum, according to qualifications.

Write, giving details of age, qualifications held, and professional experience, to "M.O.," Box 677, A.K. Advertising, 4, Talbot-mansions, Museum-street, W.C.1.

Doctor, aged 39, well qualified and

holding Diploma in Anæsthetics, unfit for military service, requires ASSISTANTSHIP in large practice with view to Partnership.—Address, No. 864, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

Wanted, Partner in firm of three in

very active high-class Practice in country district near London. Applicant should hold a university degree, should be well qualified, and some previous experience of general practice is essential. Particulars on application.—Address, No. 855, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

North-East Coastal Town. Receipts

averaging £3500 even in war-time. Panel 1200 approximately. Well-fitted and modern house of corresponding size.—Address, No. 860, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

Medical Book Traveller required to

call upon Doctors in Scotland, with the British Encyclopædia of Medical Practice. Salary, commission on orders, and expenses will be paid. It is essential that any applicant should have had experience of this class of work and should not be liable to be called for military service.—Apply, giving full particulars, qualifications, and experience, to BUTTERWORTH & CO. (PUBLISHERS) LTD., 37, Essex-street, London, W.C.2.

For Sale, Leitz Microscope. Tube

length 170 mm. Distance of image 250 mm. Height 11½ in., width 5 in. Very little used. Condition as new.—Address, No. 863, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

PREVENTIVE MEDICINE IN WARTIME

The prophylactic value of T.A.B. Vaccine has long been established, and the production of a high degree of immunity against tetanus has been rendered practicable by the introduction of Tetanus Toxoid. Both prophylactics are in regular use for the protection of the fighting forces, and similar protection for the civilian population is widely favoured.

Simultaneous immunisation against typhoid, paratyphoid A and B and tetanus can be carried out with the minimum of inconvenience to the patient and operator by the use of 'Wellcome' T.A.B.T., which combines T.A.B. Vaccine and Tetanus Toxoid.

'WELLCOME' ANTI-TYPHOID-PARATYPHOID VACCINE (T.A.B.)

Each c.c. contains
1000 million *Bact. typhosum*,
750 million *Bact. paratyphosum A*,
750 million *Bact. paratyphosum B*.

Containers of 1 c.c., 1.5 c.c. (sufficient for one immunising course), 10 c.c. and 25 c.c

'WELLCOME' TETANUS TOXOID

Containers of 1 c.c. and 5 c.c.

'WELLCOME' ANTI-TYPHOID-PARATYPHOID VACCINE WITH TETANUS TOXOID (T.A.B.T.)

No. 1 (first dose) contains
500 million *Bact. typhosum*,
375 million *Bact. paratyphosum A*,
375 million *Bact. paratyphosum B*.
} in 1 c.c. of Tetanus Toxoid.

No. 2 (second dose) contains
1000 million *Bact. typhosum*,
750 million *Bact. paratyphosum A*,
750 million *Bact. paratyphosum B*.
} in 1 c.c. of Tetanus Toxoid.

Sets containing two 1 c.c. ampoules and two 25 c.c. rubber-capped bottles of each strength.

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